Labour Canada

Discussion Paper Series

Women's Bureau
Series B: Changing World of Work
No. 1 Towards the Integration of Women into the High Technology Labour Force in the National Capital Region

Canada

Women's Bureau
Series B: Changing World of Work
No. 1 Towards the Integration of Women into the High Technology Labour Force in the National Capital Region

Prepared for the
Women's Bureau
Labour Canada
By:
Communicado Associates
Ottawa, Ontario

Note: The opinions presented in this paper do not necessarily reflect the views of Labour Canada.

Published by Authority of the Honourable Charles L. Caccia,
Minister of Labour, Government of Canada

Egalement disponible en français sous le titre

L'intégration des femmes au marché du travail créé par l'industrie de technologie de pointe dans la région de la capitale nationale

For additional copies contact:

Publications Distribution Centre
Labour Canada
Ottawa, Ontario
K1A 0J2

(819) 994-0543

© Minister of Supply and Services Canada 1982

Cat. No. L 39-22/1-1982E

ISBN 0-662-12254-2

Printed in Canada

TABLE OF CONTENTS

	Page
PREFACE	1
Purpose	1
Focus	1
Method of Study	2
Acknowledgements	2
Nation-wide Application	3
EXECUTIVE SUMMARY	5
References	8
CHAPTER I - THE NATIONAL CAPITAL REGION HIGH TECHNOLOGY INDUSTRY	9
Introduction	9
Employment Policy	12
Promotions Within High Technology Industries	13
Training	15
Attitudes of the Sexes: Traditional Myths Linger On	16
Suggestions to the Community	17
References	18
CHAPTER II - THE FEDERAL GOVERNMENT	19
Introduction	19
Computer-related Government Jobs	20
a) Engineers and Technicians	20
b) Computer Systems Administrators	20
c) Data Processors	21
d) Word Processors	21
Union Activity	24
Summary	24
References	25
CHAPTER III - SURVEY OF WOMEN IN THE NATIONAL CAPITAL REGION	27
Introduction	27
Survey Results	27
- Questionnaire No. 1	27
- Questionnaire No. 2	29
- Questionnaire No. 3	30
A. Word Processor Operators	30
B. Electronic Assembly Workers	31
- Questionnaire No. 4	32

Page

CHAPTER IV - COUNSELLING, EDUCATION AND TRAINING FOR WOMEN IN THE NATIONAL CAPITAL REGION 35

A. Counselling 35
B. Educating, Training and Retraining Women for High Technology and Computer-related Occupations 36
1. Education at the High School Level 36
- Affirmative Action 39
- The Secondary Education Review Project Report 40
2. Adult Education 41
3. Universities and Colleges in the National Capital Region 41
4. Private Business Schools 43
5. Canada Employment and Immigration Commission 44
6. Training Offered by the Government of Ontario 47
Summary of Government Funded Training Programs Sponsored by the CEIC 47
References 48

RECOMMENDATIONS 49

The High Technology Industry (private sector) 49
Governments 49
Training 49
Education 50
Awareness 50

CONCLUSIONS 53

GLOSSARY OF DEFINITIONS 55

BIBLIOGRAPHY 59

PREFACE

Purpose

Over the past few years, the high technology industry in the National Capital Region has been expanding faster than any other sector of the local economy. This industry, called "high tech", is largely based upon the development of the "silicon chip" or micro-processor. This tiny device has the capacity to add the memory function of a computer, a machine that, in the past, required manual operation.

The purpose of this study is to facilitate the integration of women in the National Capital Region into micro-electronic and computer-related occupations.

Focus

The National Capital Region was chosen to be the focus of this study due to the large concentration of high technology industries which are situated here, and also due to the presence of the federal government which is now using new technological methods in several of its departments. In this report, we will focus on these two sectors of the local economy. We have not included other types of employment which are also affected by technological change: banks, insurance companies and the telephone company. Since the federal government is the largest employer in Ottawa, and the high technology firms are the second largest, we felt that these two groups will have the greatest impact on the employment opportunities for women in this region in the near future. A study done by the Ministry of Industry and Tourism predicts that, in 10 years, the high technology industry will be the largest employer in the region. This means that more jobs will exist in this sector for women, and could very well replace the jobs which some experts predict may be lost in the public and private sector due to technological innovations in office equipment. It is imperative, then, to explore the situation in this industry, the types of jobs which are available, the job requirements, and the needs of the industry in order to ascertain what the opportunities are for women in this region.

The types of employment which we will be examining in this report are those which are related to micro-electronics or computers. In the high technology industry, for example, workers are employed to assemble minute electronic components. Women are preferred for these low-skilled jobs because of their allegedly superior ability to work with small and quite intricate electronic components. Some of the local companies report that up to 85 per cent[1] of their assembly workers are women. They tend to experience very little turnover with these employees. In fact, it has been reported that their biggest turnover problem is not with these assembly workers leaving their jobs, but is due to their being promoted to quality control levels. In the more traditional areas of female office employment, electronic office equipment is rapidly changing the nature of the work

---

[1]Information obtained from Cheryl Currie, Commercial Business Officer, CIDC, Ottawa.

which is being carried out. Women are now being employed as word processors, data processors, computer programmers, systems analysts, etc. Since the majority of women who are working in micro-electronic and computer-related employment in this region are employed as word processors, data processors, clerks and assembly workers, our study has concerned itself with these occupational groups.

Method of Study

The main thrust of our study was to examine the needs of high technology employers and compare these needs with the qualifications, interests and aptitudes of women in the National Capital Region who were:

a) coming into the work force;

b) already in the work force; and

c) re-entering the work force.

To this end, a series of interviews were conducted with representatives of the high technology industry. As well, a cross-section of women from the region, chosen to represent the female work force, were interviewed to determine what they considered to be the employment opportunities and obstacles in the micro-electronic and computer-related field.

Research was done and interviews were carried out with several representatives from the federal public service who are interested in the employment of women in micro-electronic and computer-related areas. Those concerned with the training and retraining of women for such employment were also interviewed.

An examination of the educational programs and on-the-job training programs which are available to women in the National Capital Region was also carried out.

Acknowledgements

This report would not have been possible without the assistance of the few hundred people who co-operated with us in providing the information. We wish to thank them all for their support - the high tech personnel who found the time for us in their hectic workdays; the women who answered our questionnaires so candidly; the government, university and education representatives who helped us to define our study and untiringly research its content. The candour and helpfulness of all concerned has, we trust, resulted in a report which will benefit both women and the high technology industry in the National Capital Region.

Nation-wide Application

It is hoped that elements of our findings can be applied to other parts of Canada as the information revolution brings about changes. Our survey of the current literature leads us to believe that the conclusions we have reached, and the recommendations we have made, can, with some modification, bring universally-desired changes.

EXECUTIVE SUMMARY

The purpose of this study is to determine what opportunities for women are offered by the high technology industry, what may be the existing and potential impediments, and to integrate women into a rapidly-evolving new labour market in the National Capital Region of Canada. This labour market, called "high-tech", is based on micro-electronic and computer-related technology, and, for reasons beyond the scope of this study, it has 'boomed' in the Ottawa-Hull region in the last two-three years.

At present, it is estimated that about 6 per cent[1] of the people in this area are employed in micro-processor and computer-related jobs. The rapid growth of such jobs is obvious to everyone; predictions about the actual rate of growth and how long the boom will continue are quite varied, but one estimate is that by 1990 the high technology industry will employ as many people as the federal government does in this region[2].

What is happening today is historically unique in many ways. New inventions have certainly transformed landscapes or cities before, but what is now happening globally is a technological change based on the discovery of one of the tiny silicon chip's uses. What has resulted is a profusion of new technological jobs which are completely different from the ones found prior to the computer or information revolution.

To keep pace with the changes that the 'chip' has wrought requires courage, curiosity, a willingness to learn and adapt and, for many people, encouragement and assistance from others. This study takes a look at the requirements of the new industry and at the response of women to its needs.

Are women owning, managing, promoting, inventing, developing or servicing the high technology industry here? Are they well-informed about its existence? Are they unaware of it? Are they familiar with the various opportunities it opens to them? Are women knowledgeable about the scientific and engineering aspects of the new technology? Are women being prepared by their schooling to get the well-paid jobs this industry offers? Are women aware of the levels of jobs that exist and how much can be earned at each level? Are women aware of the impending obsolescence of many of the present-day secretarial and clerical jobs, and have they considered what they will do if their jobs are deskilled, dislocated or discontinued? Are women ambitious to own and manage "high-tech" companies, and if so, are they equipped to do it? Are women content to transfer into the women's job ghettos which have already emerged in the new industry? Are women aware of the training opportunities offered by the federal government, educational institutions and employers, and can they afford the training? Do they have the entrance requirements? Can they find the time to cope with this retraining along with their family responsibilities? Are women confident of their abilities to adapt to "high-tech" jobs, or are they afraid?

Above all, are women taking advantage of this existing development in the National Capital Region or are they allowing history to repeat itself?

These are just some of the questions that this study addresses. In order to answer these questions, a cross-section of women in the Ottawa-Hull area were interviewed to determine their awareness, their involvement and their attitudes towards the industry. The interviews also sought to identify the barriers they perceived to their employment and mobility within the industry, and the results of our survey questions are reported in Chapter III. In the first chapter, this report describes the industry and summarizes the findings of our interviews with the managers and personnel directors within it. Since the federal government is the largest employer in this region, we have devoted Chapter II to reporting on our findings concerning the opportunities for women in computer-related government jobs. The time allotted to this task has, of necessity, been brief, but our findings appear to be substantiated by current literature on this subject.

The availability of "high-tech" training has been thoroughly investigated in the region. The school boards are, to varying degrees, introducing computer studies into the curriculum and there are, at the college and continuing education levels, a considerable range of available courses. There are not enough places at present, however, to meet the needs of the industry in several job categories which are described in this report, and, unless the training opportunities are augmented, acute shortages will continue to increase in many areas. Already the national shortage of scientists, engineers and computer professionals is being sharply felt in this region, and is influencing the hiring practices of certain companies.

Enquiries were also made as to whether employers train employees on the job and whether they are prepared to assist with the cost of outside training courses. For the most part, it was found that assembly-line workers receive on-the-job training, as do some word processors, but that at higher levels, it would be impractical to provide training for reasons described later. There were also some fears expressed that such trained employees would be liable to transfer to other companies to better their positions or salaries subsequent to receiving training.

One regrettable finding, which may take a decade to change, is that there are very few women in the well-paid scientific and technical jobs of the high-tech industry, as in the same jobs in other industries. Our findings are supported by the Science Council of Canada's findings that high school girls must continue to study science and mathematics if they intend to compete for the better jobs. The Council's study also points out that the change of attitude this requires is of vital importance to our economy, as well as to the lives of individual women[3].

A discussion of opportunities for apprenticeship, skill-training, upgrading and retraining are included in Chapter IV, and some recommendations are given at the end of this report. The authors believe these recommendations will help to nurture equality of opportunity between women and men in obtaining employment and training within the high technology industry.

Our findings regarding the National Capital Region can be summed up by pointing out the discrepancy between the many opportunities which now exist in the high technology industry, and the perception or more accurately the fact that women have not perceived that these opportunities exist. This discrepancy is disappointing, to say the least. Women are, for the most part, ill-informed and afraid of the technological world. Some of the reasons for this are explored in this report, and it is a well-documented phenomenon in other studies[4]. Whether the early socialization of females is at fault, or the fault of the educational system from which most females emerge without credits in mathematics and science, or the fault of the mass media which seem to perpetuate the myth that a woman will have a man to depend on for her livelihood, and therefore does not need to prepare herself for a rewarding career in the labour force, is not our task to decide in this study.

However, we strongly recommend for the sake of our economy and for the enrichment of the lives of the women in this area, that an awareness campaign be launched to alert employees, educators and women themselves to the opportunities which are at hand.

References - Executive Summary

1. Information obtained from Cheryl Currie, Commercial and Industrial Development Corporation, Ottawa, February 1982.

2. Ontario Ministry of Industry and Tourism, Microelectronics '80: A Survey of High Technology Companies in the Regional Municipality of Ottawa-Carleton, Ottawa, October 1980.

3. Science Council of Canada, A Statement of Concern: The Science Education of Women in Canada, Ottawa, January 1982.

4. Scott, Joan Pinner, Canadian High School Girls Science Subject Choice and Achievement Behaviour in the Context of Co-Educational Schools and the Labour Market, Toronto, 1980.

CHAPTER I

THE NATIONAL CAPITAL REGION HIGH TECHNOLOGY INDUSTRY

Introduction

Whether or not the National Capital Region is really "Silicon-Valley North", as it has come to be known, is debatable. This label is not yet in widespread use although few people can be unaware of the extra-ordinary pace of development of computer-related companies here. In the past decade, computer firms manufacturing and selling the hardware and software of high technology have sprung up throughout the area with a notable concentration in Kanata, a new town 20 kilometers west of Ottawa. The average growth rate within these firms is steadily increasing, at an estimated average rate of 25-30 per cent[1].

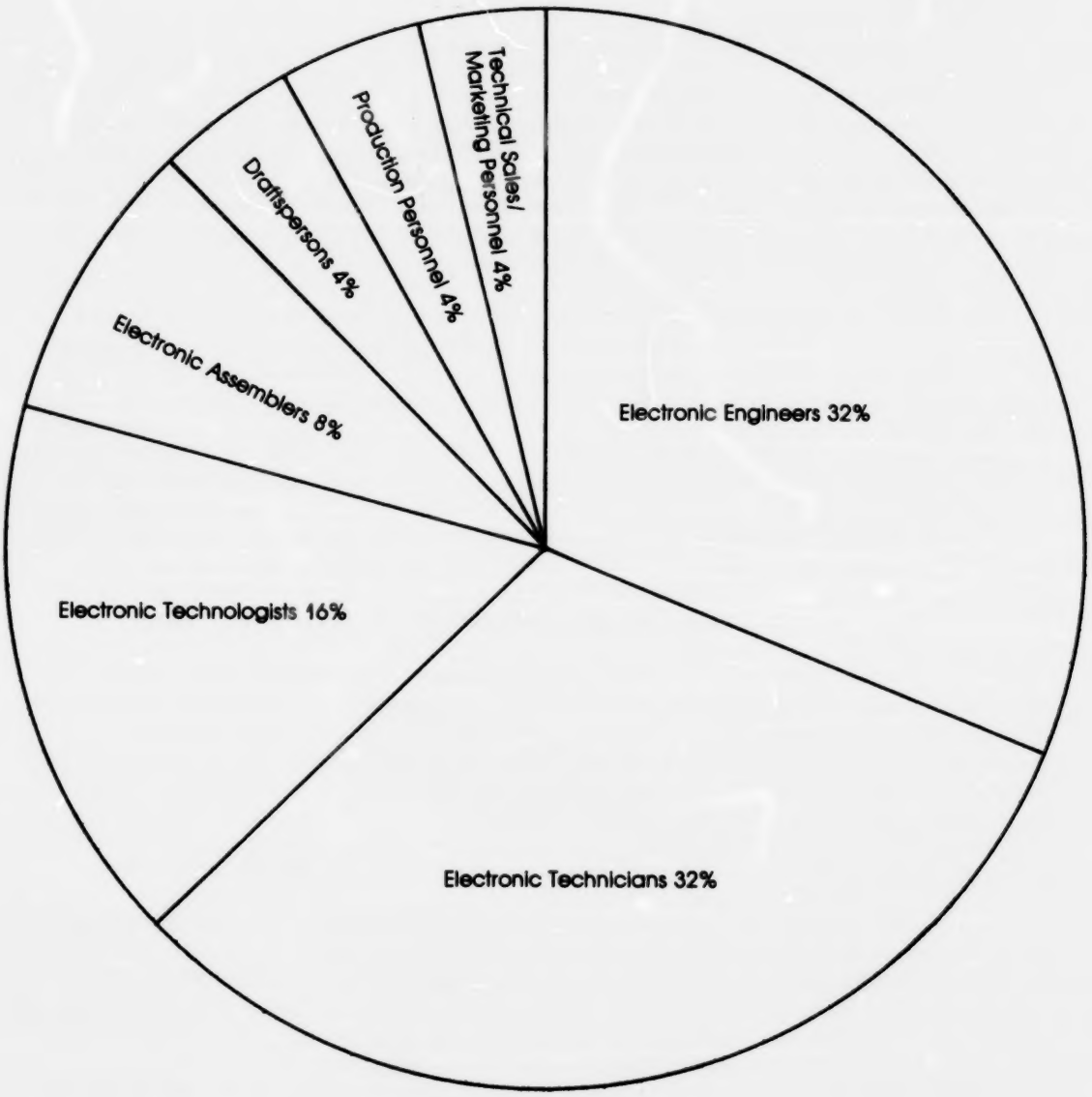
As of 1980, there were over 100 high technology manufacturing firms, and about 200 sales and service firms in the area, with a combined sales revenue of over half-a-billion dollars[1,2]. Six per cent of Ottawa's work force was then employed in this industry and employment opportunities are currently growing faster than in any other sector of the local economy. A study done by the Ontario Ministry of Industry and Tourism[1] predicts that in 10 years the high technology industry will be the largest employer in the region. By the year 1990, it is predicted that 100 000 jobs will have been created - if normal conditions prevail in the national economy. This means that jobs for women will be found in this sector which could take the place of those jobs which may be lost in the federal government or the private sector due to technological innovations in office equipment.

It is imperative, then, to investigate this industry and to ascertain what opportunities exist in it for women. There have been ample studies on the impact of technology, and its effects on traditional employment[3,4]. There has, however, been very little research done in the area of 'replacement employment'; that is, employment which will replace jobs which are lost due to technological change. In Ottawa, due to the existence of the expanding high technology industry, there appears to be a growing number of 'replacement' job opportunities for women and men.

Because the industry is growing so rapidly, it is difficult to provide statistics about the demand for employees which have any validity for an extended period of time. A study done by the Ontario Ministry of Industry and Tourism in October, 1980, reported that there are shortages of electronic engineers, electronic technicians, electronic technologists, electronic assemblers, drafting personnel, production and marketing personnel and in sales[1] (see Figure 1). In the future, it is anticipated that the greatest demand will be for electrical engineers, electronic technicians and assembly workers (see Figure 2). By 1985, it is predicted that the number of electronic technicians employed will increase by 340 per cent. The need for assemblers is expected to increase at a somewhat lower rate in the same period of time, with 297 per cent more being employed in 1985 than today[1].

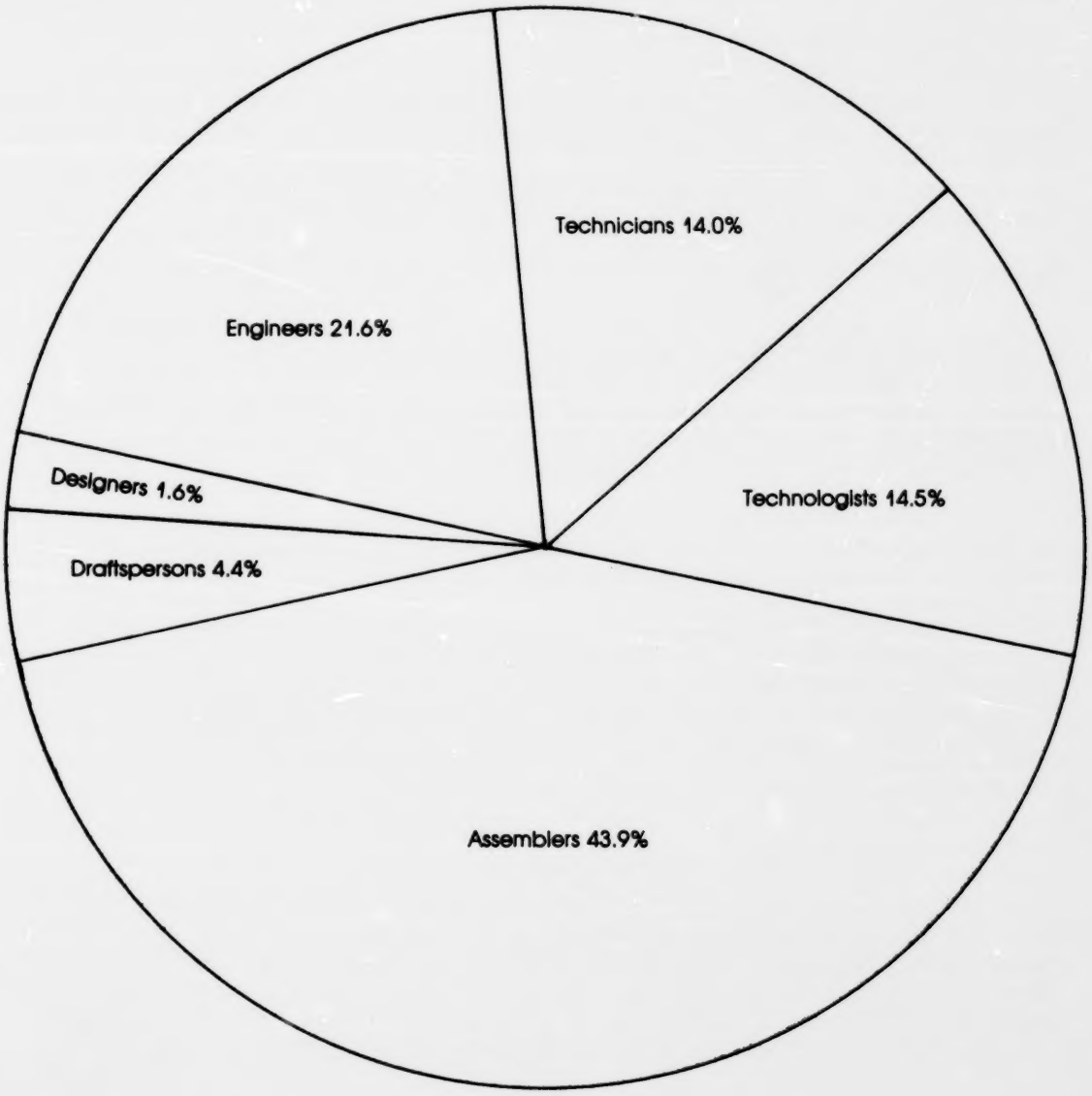
Figure 1

CURRENT SKILL SHORTAGES



Source: Province of Ontario Ministry of Industry and Tourism (Ottawa Office), "Micro-electronics '80"

PROJECTED 1985 NEEDS



Source: Province of Ontario Ministry of Industry and Tourism (Ottawa Office), "Micro-electronics '80"

The shortage of qualified workers in Canada has, in the past, forced companies to recruit much of their skilled labour from abroad. Canada is now competing with other highly industrialized countries for the workers who are available, but, faced with an increasing global shortage, Canadian employers are realizing that Canadians must be their own main source of labour[5]. The rapidly-expanding micro-technology industry found here has severe shortages of skilled personnel at all levels -- from engineers to assemblers (Figure 1). In order to fill these needs, Canada will have to train, retrain and upgrade its labour force. Challenging careers await women who have the proper training and education to work in this field.

We will discuss the training and educational issues, in-depth, in Chapter III of this report. In this chapter, we will summarize the results of our interviews with the high technology employers in the National Capital Region. In these interviews we attempted to discover what opportunities and barriers exist for women in the high technology industry.

Employment Policy

The managers and personnel officers interviewed were unanimous in stating that hiring depends on qualifications, not sex or age. If there is a job to be done then "let the best woman or man do it" was a phrase commonly used. Some representatives of high technology firms have stated publicly their beliefs that women should move into the industry while it is still young because there are many opportunities for them.

A study done by the Ottawa-Carleton Industrial Training Council[6] in 1981 found that methods of filling employment vacancies in the high technology industry, ranked by frequency of response, were as follows:

- newspaper advertisements
- personal contacts or word of mouth
- Canada Manpower
- college/university contacts
- personnel agencies
- walk-in applications
- industry contact
- raiding other firms
- overseas sources

Tests to determine logical ability - something required in many high technology jobs - are often used in the selection of personnel. A large recruiting agency uses a wide variety of these tests, and has a part-time psychologist to provide consulting services. Initial screenings of applicants are usually undertaken by a personnel officer of the company, and the final decisions are made by the supervisor or line officer.

Although there are shortages in the industry, only people with appropriate qualifications are hired. The pace of work is demanding, as are the employers. By and large, the working conditions are good, and companies are not yet unionized. Benefit packages offered by these companies are generous, reflecting management's concern to maintain good

relations with their staff. Dental plans, medicare, generous paid vacations, profit-sharing and financial assistance to continue education are some examples of the benefits we heard of. Hence there is a need to do high quality work in order to keep a job or gain a promotion.

In the technical and professional job categories, where the shortages are most acutely felt, there is little room for choice. Qualified candidates, be they men or women, must be considered. On the other hand, as few women are educationally prepared for these positions, they are at present male-dominated (Figure 3). At the technical level, there is no clear division of jobs by sex, and the accessibility to these jobs was mentioned in all of our interviews. Word processors and computer parts assembly workers are predominantly female, as Figure 3 shows. The differences observed at the professional levels reflect the occupational choices of men and women at university and college, and the reasons for this discrepancy are discussed further in Chapter IV. The chart below summarizes, approximately, the ratios of men and women employed in the various occupational categories of the local high technology industry. (Definitions for these occupations are provided in a glossary at the end of this report.)

The high technology industry is dominated by engineers. They become the top executives in most cases because, without a computer science or engineering background, it is impossible to be a high technology senior manager. For the most part, women are employed in personnel, accounting, assembly, public relations (to a limited extent), and in the traditional office positions which the industry requires.

Promotions Within High Technology Industries

We were told repeatedly during our interviews of the opportunities for promotion which exist for women in the high technology industries. Some companies reported their largest turnover problems are not with employees leaving the firm, but with employees being promoted. Programmers move up to become analysts, engineers become managers and assemblers become quality control personnel. As mentioned, there are many more women employed as assemblers than in the professional and skilled jobs, but even at this low-skilled, relatively low-paid level, there are quickly-evolving opportunities and rapid promotions.

We found few women at the administrator/executive level in these industries, and no women owners. It is difficult to generalize about job mobility at this level, or to determine how far a woman could advance herself within a particular firm. Much of what was stated by industry officials in the interviews is particular to the company, whether it is in manufacturing, sales, service or consulting. Also, the attitudes of the managers and decision-makers within the company influence company policy and procedure regarding their employees. We met several women who held senior positions in the industry. From these women, we heard mixed reports on the barriers and opportunities which they face. Some felt that there were few barriers, that women were encouraged and supported in the industry, while others felt that traditional chauvinistic attitudes still make it difficult for women to succeed. All, however, seemed to agree that

FIGURE 3

Requirements, Salary Ranges and Ratios of Men and Women Employed in the Regional High Technology Industry by Occupational Category

Occupation	Approximate Percentage of Women Employed	Requirements	Salary Range*
Electronic Engineers	less than 10% (est.)	4 year university	junior - $20-$24 000 senior - $25-$30 000 +
Electronic Technicians	less than 10% (est.)	2-3 years college	junior - $12-$14 000 senior - $14-$18 000
Electronic Technologists	less than 10% (est.)	3 years college	junior - $14-$17 000 senior - $18-$22 000
Computer Programmers	less than 30% (est.)	university, college or private programmed training courses	junior - $14-$17 000 senior - $20-$24 000
Systems Analysts	less than 20% (est.)	BA in math, engineering or science, programming experience required	junior - $20-$24 000 senior - $25-$31 000
Word Processors	99.9% (Federal Public Service)	on-the-job, private secretarial school, community college, secondary school, grade 12 English and math required	junior - $10-$12 000 senior - $14-$17 000
Assemblers	85%	on-the-job	$4.50 per hour and up

*As listed at the Canada Employment and Immigration Commission, June 1981.

success is dependent on keeping up-to-date in this fast-moving industry. In some cases, it may be that women have to work harder and be more productive than their male counterparts.

Overall, the impressions we gained from our interviews with representatives of the industry lead us to the conclusion that many opportunities do exist for women. Impediments to the opportunities are: lack of professional and technical training, lack of career orientation on the part of some women, and barriers created inadvertently by the existence of traditional attitudes of employers towards female staff.

Training

The high technology industry in the National Capital Region is dependent on publicly-funded institutions for the training of its professionals, technicians, programmers and systems analysts. The University of Waterloo's Cooperative Program was frequently mentioned as one which educates professionals for the industry, and other Canadian universities and colleges provide engineers and technically-trained employees. Companies train their own employees to use, service, sell and provide consultation about their particular products. Some companies will pay training costs at local institutions so that employees may attend night classes, but in practice there are time constraints and family responsibilities which make this a difficult alternative for many women.

Assemblers are trained on the job. One company has computerized training programs available for employees to upgrade themselves on their own time. Another company employs women who have been working in the service sector (e.g., young women from fast food chains and department stores) and trains them to be word processors. This last type of training activity is one which should be encouraged, as it could provide alternative 'replacement' employment for the jobs which are becoming obsolete in the service sector due to computerization.

Intentional differences in the training of women and men were not apparent. Undoubtedly, the many factors already mentioned - education, ambition, career orientation and determination - affect managers' choices of trainees at all levels. Some personnel officers stated that more men than women were likely to complete training for a career in the industry because family responsibilities make retraining or upgrading difficult if the retraining/upgrading is to be carried out after regular working hours.

If women are required to pay to continue their education while employed by a high technology company, the cost of this training may be prohibitive. It is to be expected that, since women earn less, on a national scale, than men, the cost of continuing their education is often a problem, especially considering the costs of day-care or baby-sitters.

These issues will be addressed further in Chapter IV of this report. However, in view of increasing unemployment and a rising shortage of skilled workers in Canada, on-the-job training may be an alternative which would allow both men and women to enter and advance in this new area.

We found very little evidence of apprenticeship training in the industry. One firm did, however, have an apprenticeship program which employed about 110 people. This training method was definitely preferred by the women we interviewed, and it remains to be seen whether shortages now being experienced by the industry will result in many employers establishing apprenticeship programs.

Attitudes of the Sexes:
Traditional Myths Linger On

As discussed earlier, interviews with both management and production personnel in the Ottawa high technology companies led to the conclusion that this new industry offers challenging and remunerative careers for women with the proper training. We did, however, encounter some attitudes which indicate acceptance of traditional stereotypes which have played a role in barring women from moving into non-traditional areas of employment in the past.

Learning the rules of the game was recognized as a requirement by both female and male company representatives. One woman we interviewed stressed the need to recognize the difference between assertiveness and aggressiveness, and to recognize that if one's promotions were dependent upon the 'boss', to compromise when necessary. Interestingly, tokenism has been expected by some women who assume they will be hired to meet quotas. They are not, because such quotas do not exist in any of the companies we visited. Some hesitancy about women professionals was believed to be due to the fact that men were not used to having women working with them in engineering or technical fields. It felt "strange" to have them there.

Several times it was mentioned that women are not as well trained for job searches as men; they need to understand what is meant by some questions asked in job interviews and realize that questions such as, "Have you any children?" may mean, "Can I count on you for overtime?"

Personnel officers repeatedly stressed that knowing how to handle these kinds of questions when they arise in interviews is important to successful job hunting. These job-search skills are required in order to "play the game" and compete equally with men for employment opportunities.

In order to prevent the perpetuation of the stereotypes described above, it is essential that employers be encouraged to institute active equal opportunity programs. Awareness among women is also essential; women must be prepared to deal with discrimination, whether real or perceived, when they encounter it. The Canada Employment and Immigration Commission is doing some valuable training and awareness work in this area as part of some of the programs they have established for women. These programs will be discussed in Chapter IV.

This section may best be concluded by recognizing, as many have done, that many men still feel more comfortable and natural working with other males. Although not universal, it did seem that men were aware of women moving into their fields, but traditional stereotypes and attitudes were in some cases still prevalent.

Traditional attitudes should by no means dissuade women from entering non-traditional areas. Several of the employers with whom we spoke responded favourably when questioned about the integration of more women into the high technology industry. It is important that women are encouraged to move into this area and to dispel the lingering myths. The careers which exist for qualified women in the field are exciting, well-rewarded and worth the extra effort.

Suggestions to the Community

Our discussions with representatives from the high technology industries in the region brought forth several suggestions which reflect the concerns not only of industry, but government, educators and the general public. Some of these suggestions follow:

- For young people who are presently enrolled in high school, a good education with a strong background in mathematics and science (at least to the grade 12 level) was encouraged. Young people should be trained to research the job market, to know where the jobs are, and to maintain realistic expectations for themselves about their future.

- Students in Grades 7 and 8 need to appreciate fully the technological revolution which is taking place. Further introduction of computers and machines into the schools at this level was recommended.

Many of the firms in the region have realized that they did not alert the educational community as to their manpower requirements. Although they felt that educators are aware of the industries' needs, and are trying to meet some of these needs in the design of their curricula, there is much more to be done to educate the public at large. Awareness of this industry in the community is essential to foster public involvement and also to establish effective communication between the general public, industry, educators and government. Some of the larger employers in the area are working with educators on this issue, and this work should be supported and expanded to include all sectors of the society.

A unique example of this co-operation is the Mitel-Systemhouse Chair which was established last year at Carleton University. This chair was a gift from these two industries to Carleton University to establish a five-year position for a professor of office automation. Besides teaching in the field of office automation, the professor who holds this chair is also doing an extensive survey of the research being done in Canadian universities on office automation. Proposals are also being submitted, through this chair, to the Department of Communications Office Communications Systems Project to evaluate the human and social impact of one of their field trials. The work that is being done through this chair is extremely valuable and should be encouraged.

References - Chapter I

1. Ontario Ministry of Industry and Tourism, Micro-electronics '80: A Survey of High Technology Companies in the Regional Municipality of Ottawa-Carleton, Ottawa, October 20, 1980.

2. Commercial and Industrial Development Corporation, CIDC Business Directory, Ottawa, 1981.

3. Menzies, Heather, Women and the Chip, Institute for Research on Public Policy, Ottawa, 1981.

4. Peitchinis, Stephen G., The Employment Implications of Computers and Telecommunications Technology, Department of Communications: Ottawa, April, 1981.

5. House of Commons, Canada, Work for Tomorrow: Employment Opportunities for the '80's, for the Parliamentary Task Force on Employment Opportunities for the '80's, Ottawa, Cat. No. SC-2-321/4-01E.

6. Ottawa-Carleton Industrial Training Council, Advanced Technology Human Resource Requirement Survey, Ottawa, May 1981.

CHAPTER II

THE FEDERAL GOVERNMENT

Introduction

An attempt has been made in the course of this study to investigate the present situation of women in the computer-related sector of the federal government in the National Capital Region. At the outset, it should be said that it has proven difficult to arrive at clear conclusions, firstly because of the absence of a central source of information on this subject, and, secondly, because of the divergence of opinions between managers and operators of equipment.

It is difficult to generalize about employment in computer-related occupations in federal departments, because there are differences depending upon many factors, such as delivery of services and the organization of the department. Obviously, Statistics Canada would be a processor of information on a different level, for example, than would be the specialists concerning themselves with Telidon.

There have been few studies to date on technological change and its effects on employment in the federal public service, but this situation is rapidly changing. A large scale project has been set up jointly by the Department of Communications and the Department of Industry, Trade and Commerce. Called the Office Communications Systems Project, it is working to set up field trials in several government departments to monitor the various aspects of an electronically-integrated office system.

Field trials are already in their initial phase in several government departments (Industry, Trade and Commerce, the Department of Communications, the Treasury Board, Environment Canada and the Ministry of State for Economic and Regional Development). A senior intergovernmental committee has been established so that departments and groups can report to the Office Communications System Project on their specific concerns and needs regarding the integration of new technology into the office. This committee is divided into three subcommittees -- social and behavioural, communications and productivity. Hence all concerns and recommendations are eventually integrated into the various field trial proposals. This project is set up so that all aspects of office communications and technological advancement can be thoroughly investigated before they are implemented into a work setting. The human and social impact of these new technologies are being thoroughly investigated, and field trials will be monitored and reviewed to insure that the interests and needs of all groups who are, and will be, affected by advances in communications and office technology -- women, labour, management and industry -- will be accommodated.

It is possible to obtain some of the approximate numbers of federal public servants in this region who are employed in occupations which are directly related to, or have been affected by, technological change[1]. As of December 1980, there were 8 370 employees in the scientific

and the professional category, approximately 1 503 of whom are women. In the DA (con) group (of the support category), who are mainly data processors, 97.89 per cent are women. What is more difficult to obtain are the actual numbers of employees who are spending the majority of their work time in technology-related occupations, as there are many groups which use computers, data processing, videotex, teletex, microfiche, etc., on a daily basis, at all levels in the federal government.

The following discussion is based on interviews with officials in the Treasury Board, the Public Service Commission, the Department of Communications, the Department of Public Works, the Department of Industry, Trade and Commerce and Statistics Canada. Some of the female employees in the occupational groups under consideration were also consulted.

Computer-related Government Jobs

A summary of the present computer-related opportunities in the federal public service in the National Capital Region is given below.

(a) Engineers and Technicians

Professional and technical personnel such as electrical engineers, electronic engineers and electronic technicians are in very short supply in the federal government, mirroring the nation-wide shortage. Jobs are easy to come by and some are well paid for those with the right education, but, as will be discussed in Chapter IV, very few women have the necessary qualifications for these jobs.

Engineers and technicians are classified in the scientific, professional and technical categories. In December 1980, there were approximately 1 163 employees in the National Capital Region in the engineering group (ENENG); approximately 15 of these were women. In the technical category, there were about 633 electronic technicians (EL) in this region, and one of these is a woman[1]. Traditionally, most women have not set their sights on such careers for reasons beyond the scope of this report, but have discussed it in some detail in the recent Science Council of Canada publication, "Who Turns the Wheel?"[2]. It should be pointed out here that there are no biological reasons why women cannot pursue these highly paid professions; the societal influences which deter women from scientific and technical jobs must be changed both for the sake of the Canadian economy and the careers of women themselves.

(b) Computer Systems Administrators

For 1982, between 120-150 computer systems administrators are needed[3]. As of December 1980, this group of the public service (CS) had 1 931 employees in the National Capital Region (381 of these were women); thus the shortage is approximately 6.99 per cent[1] of the total number of computer systems administrators employed in 1980.

In the federal government, there are two ways of becoming a computer systems administrator. The usual method is by training at university or college (such as Algonquin College or Waterloo University)

and such employees usually start at the CS II or CS III levels, $22 204 and $26 046 respectively.

The second way to enter the CS I group is through internal promotion in the public service, usually from a clerical job. This requires on-the-job training, which raises the question of how employees in the public service manage to be selected for this kind of advancement. It has been speculated that males in the CR (clerical) group are chosen for training and promotion at a considerably faster rate than females. The reasons for this are not immediately apparent, but are probably closely related to women's lower level of education in science and mathematics, as well as to their lesser inclination to follow such careers as will be discussed later.

(c) Data Processors

Data processors are grouped in the DA group of the public service and fall into two classes: Data Processor (conveyor) and Data Processor (processor).

In December 1980, there were approximately 1 373 employees in the DA group in the National Capital Region, 895 of whom were women[1].

Data Processor (conveyor) are keypunch operators who convert data into machine-ready form but do not actually operate electronic equipment. Ninety seven decimal eight nine per cent (650) of this sub-group are women and the salary range is $13 226 to $15 389 per annum (December 1980).

Many women re-entering the work force start in this group, some of whom progress to clerical jobs. Most employees, however, remain in this group for many years, finding that it can be readily combined with family responsibilities since job responsibilities are left behind at the end of the day. There is also a possibility of part-time work, and many employees are employed on a part-time basis.

Data Processor (processor) employees work with the electronic equipment preparing data for entry. About 34.56 per cent (245) of this sub-group are female (December 1980 figures) and the salary range is $15 700 to $19 160. There is a requirement for shift work and, at present, overtime is often called for. There is quite a high turnover in this area. Opportunities for promotion exist in areas such as computer systems administrators, but additional theoretical training is usually required in order to advance. It is possible for these employees to obtain an educational leave to continue their education at an educational institution. Depending on the specific human resource needs of the public service, this leave may be with or without pay.

(d) Word Processors

Word processors are the backbone of the OCE (Office Computer Equipment) group of the public service. They deal with data in a different way than data processors, in that they are working with inputting data into the various storage systems, retrieval systems, text editing and management information systems.

To appreciate some of the changes that word processing has helped create, it should be noted that between 1979 and 1981 the number of Office Computer Equipment Operators has grown by 35 per cent from 1 172 to 1 587 of whom 98 per cent are women. Incidentally, 80 per cent of this group are less than 36 years of age, as compared with 59 per cent in the office clerical group. At the operating level, salaries range from $11 515 to $19 006 per annum, while supervisors in charge of 8-10 operators will aim towards a $27 000 ceiling projected for 1983[3].

A wide divergence of opinions about word processing work and the opportunities it offers was noted in our interviews and survey of the related literature. Many employees find their work rewarding, particularly when they know the capabilities of the machine and when they are required to manipulate their machines intelligently, and make decisions about the storage of information, record keeping or related operations. At this level, there is a need for consultation with managers about the capability of the machines and the operator has a sense of the importance of the job.

On the other hand, there is a level of work where far less manipulative ability is required. In such cases, there is a tendency for the operator to be treated merely as an extension of a machine which may have been programmed with very restricted functions. Some respondents complained of feeling like a dumb operator at the end of a "dumb" terminal (the industry nickname for a machine with restricted functions). In an as-yet-unpublished study of word processors in three federal departments done for the Co-ordinator, Status of Women, Janice Manshee describes in more detail the conditions and attitudes of this group[4]. Her findings indicate considerable dissatisfaction among word processors who have few responsibilities and whose training is very cursory and largely depends on the operator's ability to interpret the manual. Many appear to resent the constant supervision and find that, even for those with ambition, it is difficult to advance. Probably this is a result of the current shortage of word processors and the fact that inadequate training results in operators who cannot utilize the full potential of their machines and therefore are unable to achieve their maximum potential in their job and advance to a higher category. As the new technology is introduced on a larger scale, it may present a problem for the employer if operators are not properly trained. As with any job, it is important that employees get job satisfaction and feel that possibilities for advancement exist for them.

Many of the managers interviewed presented quite opposite opinions. Some women in supervisory positions believed they ought not to leave the work force for any length of time for fear of getting left behind in this fast, moving field. Factors such as isolation from other employees, or the stress associated with working long hours, alone with a machine, were not mentioned by managers as problems. Opinions as to employee turnover varied -- in some departments it was reported to be low while others claimed it is high because of promotions and better opportunities in other departments or outside the government.

At present, the reported shortage of word processors is substantiated by the description of local training opportunities in Chapter IV of this report, which calls them inadequate to meet the current demand. Most

of the employees in this group in the National Capital Region are either trained at Algonquin College, at private secretarial schools, or in federal government departments. Seventeen per cent of the places at Algonquin are reserved for Canada Employment and Immigration Commission-sponsored trainees whose training is paid together with a $70 weekly allowance (see Chapter IV). There are waiting lists for training in all cases and, unless subsidized, the cost of such training may be a prohibitive barrier to many women. Among those federal departments which have not developed sophisticated training programs, some are taking action to obtain properly-trained operators and technical staff. As an example, the Department of National Defence is currently working on a "Review of the Office Composing Equipment Classification" to assist the Treasury Board in establishing OCE category levels more suitable to the work that is actually being done by word processors. A new classification[5] for this group is being proposed to give the occupation a better career status, and allow more opportunities for advancement to higher categories of employment. This review recognizes that many word processors are now performing duties beyond their job descriptions.

> In general, what we are saying is that we are presently not paying operators for the value of services performed, particularly as compared with the relative improvement in typing efficiency[5].

This same report also recommends that a 'model training system' be instituted in the Public Service Commission in order to train word processors more effectively on the job. It recognizes that the training which is currently available in the community for word processors (through community colleges and other sources) does not provide the quality and quantity of operators required by the government in the very near future.

Currently, there are three computer-related training courses available through the Public Service Commission, open to employees from all departments and agencies.

The M series is for those in management positions. In 1980-81, 321 females and 435 males were enrolled. In 1981-82, 289 females and 401 males attended. The series covers the following:

- Introduction to Computers
- Computer Concept for executives
- Using interacting with computer based systems
- The user role in computer based systems
- Management of government information systems
- Workshop in the development of computer based systems
- Designing effective EDP controls
- Evaluation of EDP systems.

The second series related to Computer Operations supervision and computer operations management. In 1980-81, six females and fourteen males attended.

The third series is for specialists, namely programmers and analysts. In 1980-81, 172 women and 526 men attended. In 1981-82, 186 females and 511 males took the course.

The "S" series includes the following courses:

1. Computer Systems fundamentals
2. Introduction to Fortran
3. Introduction to Cobol
4. Programming technology using Basic
5. Elements of Systems Analysis and Design
6. EDP Project Management
7. Advanced Computer Systems
8. Data Base Systems and File Organization
9. Computer Communications - concepts and applications
10. Design of on-line computer systems[6].

Union Activity

The unions of public servants are also working to negotiate changes in the collective agreements of their members with the Federal Government. A recent policy paper on Technological Change and Office Automation by the Public Service Alliance outlines their position regarding training:

> The new technology necessitates training at all levels... inadequate training can lead to stress because the operator is uncomfortable with the machine and/or cannot meet expectations regarding production[7].

Also stated is the need for re-organization of work areas where new technology has been introduced:

> Job fragmentation often results with the introduction of word processors. Where this occurs, the secretarial function is divided into administrative assistant and straight word processor operator. Relatively few administrative assistant positions are created; the majority of employees are placed in word processing pools, where their only duty is machine operation. An effort must be made to guard against the further fragmentation of jobs. Human needs and values must be considered in work organization[7].

Summary

In summary, it is evident that there is an awareness in the federal government of the effects which technological change is having on employees. The government is moving to change policies and practices which have 'ghettoized' women. Work is being done to institute proper training programs and to improve advancement opportunities for women in the government. The Office Communications Systems Group established by the Department of Communications and the Department of Industry, Trade and Commerce are involved in a large-scale effort to test and evaluate new office equipment and its effect on all groups (including women) who will be affected by it. It is important that this work be continued and encouraged, because there are still barriers facing women in the federal public service. There are also benefits to be reaped from learning about and working with new technological equipment. It is an exciting and demanding new area.

References - Chapter II

1. Data derived from Treasury Board statistics, December 1980, prepared by Personnel Applications Centre, Department of Supply and Services, Canada.

2. Science Council of Canada, Who Turns the Wheel?, Proceedings of a Workshop on the Science Education of Women in Canada, Ottawa, January 1982.

3. Figures received from Dr. J. Whiting, Acting Director, National Capital Region Office, Public Service Commission, Ottawa.

4. Information obtained from author, Janice Manchee, for the office of the Co-ordinator, Status of Women, Ottawa, 1982.

5. Department of National Defence, (Draft), A Review of the Office Composing Equipment Classification, Ottawa, July 1981.

6. Information received from Claire Valincourt, Chief, Customer Service Division, Policy & Co-ordination, Public Service Commission, Ottawa, 1982.

7. Public Service Alliance of Canada, Collective Bargaining Division, Technological Change - Office Automation, (Draft), Ottawa, 1981.

CHAPTER III

SURVEY OF WOMEN IN THE NATIONAL CAPITAL REGION

Introduction

Part of our mandate was to assess, by surveying a cross-section of women in the National Capital Region, the obstacles to employment and advancement in the local micro-electronic industry. The women we interviewed were representative of the semi-skilled, skilled and professional work force, as well as those who will be entering the job market in the near future. Four separate surveys were conducted, and a total of 86 women were interviewed using formal questionnaires. In the course of the study, we also spoke with over 200 women with specialized knowledge in fields relevant to our study. The uniformity of the responses from all of our interviews supported the results of our survey. Survey respondents were selected by industry, location, occupation and at random in shopping centers.

In our interviews with these women we attempted to determine several things. These included the level of awareness which existed within each group about high technology; the effect technological change is having and will have on their present and future employment; their attitudes towards employment in a computer-related field; their desire to work in a computer-related field plus their knowledge of training and retraining opportunities designed to assist them in improving their qualifications for computer-related employment. As well, we attempted to determine the barriers to employment and advancement which exist for these women in non-traditional, computer-related jobs.

Survey Results

Women selected for our survey were categorized for our analysis according to the following four groups:

Questionnaire 1: Women not in the labour force (unemployed, homemakers, etc.).

Questionnaire 2: Women in the labour force, but not employed in a computer-related area.

Questionnaire 3: Women in the high technology labour force (electronic assembly workers, word processors, etc.).

Questionnaire 4: Women attending a post-secondary educational institution.

Questionnaire No. 1

Those interviewed using questionnaire 1 were women who were not, at the time of the survey, in the work force. This group included women who were unemployed, homemakers, and one who was retired. In all 19 women

were surveyed. Most of these women were 26-30 years old with a family income of $5 000-$12 000 and, on average, a grade 10 education. There was an almost equal distribution of single, married, and single-parent women.

Most of these women had plans to take paid work at some point in their lives, but had no definite ideas about what type of employment might be available, or how to go about finding a computer-related job. Most of them felt that they needed some kind of training -- particularly in the mathematics and science area -- but were not sure how to get it. They also felt that they would not be able to afford the costs of training.

When asked if they knew about the new technology, most of them responded negatively. Most women admitted that they did not know very much about either the new technology, or the technological changes that are occurring generally. They were frightened by technology. They felt that high technology will displace workers and affect their employment prospects.

Although they did not know where specific training could be obtained, most of them guessed that it would be available through Algonquin College. Barriers to training were seen to be cost, fatigue and stress as a result of learning something new, as well as a lack of self-confidence. Surprisingly, day-care and transportation were, for the most part, problems which these women felt they could overcome if they were to attend a training course. Most of them felt that full-time training during the day would be preferable, and the most feasible alternative for them. They reasoned that training could be obtained faster during the day than at night, and they would be able to enter the labour force sooner.

When asked if they liked the idea of working at home on a computer terminal, the majority of respondents said no. Most of the women wanted to go to an office and work regular hours. They felt that the contact with other adults provided stimulation, and greater learning opportunity as well as a welcome separation between home and employment environments. Some felt that they would learn more from other people in a job environment than they could isolated at home. The few that liked the idea of working at home said it would give them the opportunity to take care of their children (most of this group had a number of children), and would allow them to work without pressure.

Most of these women expressed a fear of high technology. They referred to it as 'scary', 'frightening', 'intimidating'. They felt that in order to work in "high tech" they needed mathematics and science, and most felt that they had never been very successful in these areas while they had been in school. These women seemed to feel helpless at the prospect of technology; they felt they were not smart enough, and that they did not have the self-confidence to keep abreast of the rapidly changing work environment that was being created. They were also afraid that being away from home and their families while learning something new would be extremely stressful.

Questionnaire No. 2

Those interviewed using questionnaire 2 were women who were employed, but not in an area that was computer-related (or which had been drastically affected by technological change). The largest portion of this group were women between the ages of 21 and 40, with incomes ranging from $5 000-$20 000. Most of these women had a grade 12 education, and some had university credits. Income levels were not closely related to the level of education achieved. There was an even distribution of married, single and single-parent women. There were 32 women in this group.

When asked why they worked for pay, responses were nearly equally distributed among the following: to support myself, to support my family, to supplement my husband's income. Most of these women felt that they would be in paid work for the rest of their lives. Most of them knew very little about technology and, like the first group, were frightened by it. At the same time, however, about half of them felt that it would be interesting to work in this field. The other half expressed little interest in a computer-related occupation, thinking that the work would probably be boring and "alienating". Most of them felt that they would be paid better salaries if they had some computer skills, and that those who are qualified to work in a high technology field will have a better future than those who are not. Again, this group felt that technological change would mean the loss of jobs for a lot of workers. These women enjoyed the human and social elements of work, and were afraid that working with machines would be less enjoyable -- although it might make work more efficient.

Most of this group of women had not considered retraining or upgrading themselves for work in a non-traditional, technological area. Again, the majority knew very little about training opportunities available in the community, although several mentioned Algonquin College as the most likely place to find training courses. Fifty per cent of these women felt that the cost of training would be a problem for them, and, once again, half of the group cited lack of self-confidence when asked what barriers faced them in getting trained. Fatigue and stress, and lack of time were also thought to be barriers. The majority of respondents in this group did not feel that transportation or day-care would be problems for them if they were to attend a training program.

Most of the women from this group preferred the idea of an apprenticeship training program, because they would be paid during training, and it could be carried on during regular working hours. Many felt it would be too difficult to work all day and train at night due to children and family responsibilities. All were feeling the stress of employment and family obligations already. Other reasons apprenticeship training was preferred were also mentioned. Some women felt that apprenticeship training was more practical and thorough than classroom instruction, and would allow them to focus all their attention on training, without having to hold down a regular job at the same time. Because all of these women were employed, the only way to get this type of training was on the job. Very few felt that they would be able to afford a cut in salary to receive training.

Again, most of these women did not like the idea of employment at home. They liked the division of home and workplace, and the social contact an office environment provides. Some mentioned that it was easier to forget what was left undone at home if you are not there, allowing better concentration on the job.

The majority of the women in this group felt that their employers would train them if they really needed it. Many did not feel that it is their responsibility to prepare themselves for the changing work force and depended on external forces to move them to action. Many childless women, even those who earlier in the interview had said that they would probably be working for the rest of their lives, felt that at some point they would stop working in order to raise a family.

Questionnaire No. 3

This questionnaire was used to interview women who were employed in computer-related work. Two groups of women were interviewed, those employed as word processing operators, and those occupied as electronic assembly workers in the high technology industry.

A. Word Processor Operators

When we asked women how they had become word processor operators, we received a variety of responses. Some had been selected to work as word processors by their employer, some had found their jobs through friends, and some had learned on their own how to operate a machine and consequently had obtained jobs as operators. Most of these women enjoyed working with the machines tremendously; problems which concerned them related to their perception of management's attitudes towards word processor operators. They complained that their supervisors over-estimated the amount of work which could be done on this new equipment, resulting in heavy work loads. Those who worked in word processing pools found the organization of their work unsatisfactory. In this type of situation, long hours in front of a video terminal screen caused boredom, back strain, headaches, eye strain, fatigue and stress. On the other hand, those who were not in a pool found the work more enjoyable and challenging. Because they were not forced to spend an entire work day behind a word processor, these women felt they could use the machine as a tool to make their task easier and more efficient.

Most of these women did not like the idea of employment at home, nor did they like the idea of shift work. Some mentioned that flexi-time would make their jobs easier, since it allows individuals to choose their own hours.

Most of the women had trained on the job, with the assistance of a 2-day training program offered by the company who had sold their employers the word processing equipment. Only one woman had taken a course at Algonquin College, which had cost $160. When asked whether any of these women would consider taking a training or upgrading course, most responded that they would not need it. They seemed to think that there were opportunities for them to advance out of their present position without

training. Some, however, did express interest in training, expecting their employers to provide it for them. One woman suggested that one hour of training every morning might be a good model.

Among this group, we found that there is still a fear of technology. Many of these women felt that computers would, in the future, take jobs away from people. Some felt that women would be "ghettoized" in word processing pools; some expressed fear of change such as unemployment and dehumanization of work that may result due to technological change.

B. Electronic Assembly Workers

Most of the women we interviewed who were assembly workers had found their employment through their friends or relatives. When they were asked how they liked the work, most replied that they liked it very much, that it was always demanding, there being many steps and procedures to learn. These women reported that they were treated very well by their employers. Working environments were generally very pleasant and clean, promotions were available to those who earned them, and company benefits were very good. When we asked them what they did not like about their work, boredom was cited most frequently, for once procedures are mastered, the work sometimes becomes repetitive and monotonous.

None of these women had had any formal training, but in all cases employers had provided on-the-job training. One woman had had about eight months of training in short periods of one or two weeks over the past three years. None of the women interviewed were taking upgrading courses at the moment, but we were told that their employers would pay for the costs of training at night school. Most of the women felt that family responsibilities and full-time jobs were enough, leaving no time for night school.

Most of the survey respondents felt optimistic about their futures in the face of technological change. Some felt that they needed more education which they would try to get because "this is where the 'good jobs' are going to be." One comment which we heard was especially interesting: "I have been working with an engineer and have been learning a lot on the job. At school I never took science - I think if I had tasted it I would have gone into it at school - I now find it fascinating. But then I wanted to get married and have children, and now it is difficult to get the time for training."

In general, then, the women in this group felt that they were very well treated by their employers, who contributed to life insurance, dental care, OHIP, and drug prescriptions. In one company, employees had the option to invest a percentage of their salary back into the company -- for each $2 invested by an employee, the company contributes $1 up to 6 per cent of the employee's salary. (We encountered similar types of profit-sharing programs in several of the companies which we visited.) As well, employees were all given five weeks paid vacation a year, pension plans and disability allowances, as well as a maternity leave allowance.

Questionnaire No. 4

The women whom we interviewed using this questionnaire were attending a post-secondary educational institution. Nineteen women in a cross-section of disciplines were interviewed, the majority being between 19 and 23 years of age. These were distributed among the following subject areas: arts, sciences, engineering, computer science, mass communications and journalism.

Most of these young women were confident about their futures. Those in sciences, computer science and engineering areas were sure of challenging and interesting careers. They all found it hard to succeed in their areas of study, but felt that this hardship paid off, and their courses were always challenging. Of the 19 interviewed, 12 had experience with computers and 7 had not. They all felt that high technology would affect their future careers. The majority of these women, surprisingly enough, felt that they would have no problem finding a job in their fields when they graduated, and had no difficulty naming the specific career they felt they would have -- e.g., accountant, chemist, computer consultant, engineer, freelance writer, researcher, journalist in the telecommunications field. Even those who were enrolled in general arts courses felt that they would be using high technology in their career. For instance, one woman who was studying English and mass communications stated that she wanted to work with a communications firm that specialized in telecommunications. Another, who was in philosophy and expected to go on to law school, said that she was "against the takeover by computers, but expect I'll have to deal with them in the near future."

Most of the women in the engineering and science areas had pursued mathematics and science right up until second or third year of university, whereas those in arts had comparatively very little science and mathematics education -- having dropped these courses in the early years of high school. Chemistry and physics were the subjects least studied by women. Biology and mathematics appear to be more popular science options for women, most of the respondents having continued these courses until late in high school. Computer science was the course that most of the women had not taken -- only 5 out of the 19 respondents had taken computer science.

When asked why they had decided against concentrating on mathematics, science or computer science, the response was usually one of the following:

- "I'm not interested in this area",
- "I'm not sure that I could do well in this area",
- "I am not interested in the technical aspects of computers, only the social aspects", (this response mostly from arts students).

The women enrolled in science and engineering felt, for the most part, that it was not any more difficult for women, once enrolled in a non-traditional course, to do just as well as men in their classes. They felt

that women had the same aptitude as men for the logic necessary to succeed in this area, and that attitudes had changed greatly over the past 10 years towards women studying in these areas. One woman in computer science said that "in the computer field, there is equality for both men and women."

Most of the women in arts and social sciences programs felt that they would require training in computer programming at some point in their career, but none of them had any idea where or how they would find this training.

On the whole, our responses from those in the traditional areas of study were quite different from those in non-traditional areas. The women in computer science, mathematics, engineering and science who were interviewed seemed to be relatively confident about themselves and their ability. None of them felt they would need any more training after they graduated. Those in arts, on the other hand, seemed very vague when asked about their future -- although most were confident about finding employment once they graduated. When asked what they thought they would do after they had finished their schooling, some typical responses were: 'I can't really name the thing I want to do', or 'My courses are very general and it is hard to pinpoint a term for the job I might get. I like literature and art and want to work in this area.' These women appeared to be living in a vacuum, unaware of the demands of the labour force.

On the other hand, those in the non-traditional areas all seemed to enjoy their studies, and were aware of the demands for their skills in the high technology industry. These women were confident about their careers and their abilities. They were not afraid of technology, and found it a challenge which they had the qualifications and confidence to handle.

Our recommendations relating to the information obtained from these interviews are included in the final chapter of this report. But the comments of the women pointedly demonstrate the fear of the unknown felt by those who had limited ability to change their circumstances, compared with the confidence of those who have the ability to shape their futures.

CHAPTER IV

COUNSELLING, EDUCATION AND TRAINING FOR WOMEN IN THE NATIONAL CAPITAL REGION

A. Counselling

Women who are entering the labour force for a first time, re-entering, or those who are interested in changing their careers or upgrading themselves, may require assistance in assessing their skills and capabilities or in choosing appropriate careers. In Ottawa, there are several institutions and agencies which provide career counselling services, but not enough. The following section outlines the services that are available.

At Algonquin College, there is a counselling service for full-time students registered at the College, but only one staff person to provide career advice for women who are not registered students. This service is available to the public for a fixed fee of $100, but this is too expensive for many women and, therefore, prohibits the utilization of the service.

The Women's Career Counselling Centre in downtown Ottawa is funded through Canada Employment and Immigration Commission's 'outreach' program. There was, at the time of our inquiry, a waiting list for counselling services including the names of over 100 women. This centre is operated by an active and determined group of women who are keenly interested in improving the status of women. Their service is valued by those who use it, and there is no charge for counselling at this centre.

At the Canada Employment and Immigration Commission's Ottawa employment centre, counsellors are also available. A part-time officer who is concerned with the employment of women is employed at the local office. Through this office, bi-weekly seminars are organized to introduce women to non-traditional occupations. If a woman is unsure of what sort of career she is interested in, she may be given the 'General Aptitude Test Battery'. This test points out areas for which an individual is best suited. Employment and Immigration also has a computerized system called 'Choices', which determines occupational interests and provides information regarding specific occupations. No information is available as yet in this data-base pertaining to the demand in Ottawa, or elsewhere, for employees in computer-related occupations.

The type of counselling which is available through local Canada Employment Centres is intended to provide efficient and helpful career orientation. There are, however, a number of faults in the management and operation of these programs which tend to limit their effectiveness considerably. These faults were recently brought out in the Warren Allmand Task Force on Employment Opportunities for the '80s. This Report

identified many problems, which our research and interviews support, such as improper training of manpower counsellors to screen female job seekers properly for appropriate employment:

> In the case of women, it is more "productive" for a counsellor to recommend that they take a training program in an occupation that has always been filled by women, such as typing or stenography, rather than spending the necessary time determining their aptitudes or special needs[8].

Further summary of CEIC's counselling and training will follow at the end of this chapter.

Counselling services are also provided in the Region at the two universities, but, once again, costs and policy will deter some women. The University of Ottawa charges $250 for counselling to those not enrolled as students, and Carleton University provides counselling only for its students.

B. Educating, Training and Retraining Women for High Technology and Computer-related Occupations

Obviously, women with varied backgrounds could be trained or retrained to enter high technology and computer-related occupations. These include:

- women entering the work force for the first time;
- women in traditional areas of employment (clerical, sales and service) who will not be displaced by the new technology, but who will need to receive adequate training on new office machines;
- women in traditional areas of employment who will be displaced by the new technology, and who will have to be trained in a new field;
- women re-entering the job market after raising a family;
- women who are currently unemployed and seeking work;
- women in the community who may be affected by computers in the home.

1. Education at the High School Level

Repeatedly, comments were made by representatives of high technology that guidance was needed which could provide appropriate information to high school students. The need for students to graduate from Grade 12 with both mathematics and English was also acknowledged. Some of the responses of the educational institutions in the National Capital Region are recorded in this section of the report.

In Ontario, all students must remain in school until age 16. Some courses are mandatory, such as English courses which must be taken in Grades 9 through 12. Mathematics is mandatory in Grades 9 and 10 only.

The fact that fewer girls than boys continue in mathematics beyond Grade 10 is a matter of concern to many. Two recent studies relating to sex differences in course choices and achievement in Ottawa schools are relevant[1,2].

A study undertaken in Ottawa schools by Susan Jessie Russell in 1978[2] looks at sex role socialization in the high school. She found that, in terms of achievement in school grades and in terms of behaviour oriented toward occupation choice, that young men and women in the senior grades exhibit patterns of preparation for sex-stereotyped roles. Young women and men from the working class were more likely to show a decline in grades during high school. This suggests that, "both men and women from working class backgrounds are disadvantaged vis-a-vis the dominant middle-class patriarchal culture."

In terms of orientation toward future careers, young women tended to group at the extreme ends of the continuum. They either had a firm commitment to an occupational choice in a field dominated by women, or they had a wide variety of 'fantasy' career choices which led Russell to conclude that these young women would end up in low status, low skill employment in female-dominated occupational groups. Interestingly, girls tended to have aspirations in more 'masculine' fields just before puberty. These were cast aside as they realised that these career goals could conflict with more traditional 'female' aspirations. It appeared there was pressure on girls not to make commitments in adolescence so that they would be open to the kind of life and lifestyle a "chosen" man might bring with him. Young men were more self-directed.

Expectations that a daughter continue her education past high school seemed to be dependent upon social class. Young women from upwardly-mobile, middle-class backgrounds tended to be more career-oriented than women from lower class backgrounds. The most important impact on the young women's goals seemed to be their conception of how men view the role of women. As well, women modelled themselves, to some degree, on the example set for them by their mothers. Russell also observed that teachers are unlikely to propose innovative paths for girls in future work. Paid work is seen as a secondary issue for girls but one of paramount importance to boys. In summary, it is evident that young women need great encouragement and positive role-models in order to perceive themselves in non-traditional careers.

Young men tended to dominate in the high school classroom and be more active in classroom discussions than women. Teachers of either sex fostered this domination. This situation is often further reinforced by the attitudes of parents. Russell suggests that teaching English and mathematics should be segregated according to sex. At the moment, the predominance of male teachers of scientific subjects in schools and universities is viewed as a reason for girls' perception of science and mathematics as 'male' areas of study. This view discourages women from enrolling in these areas in large numbers:

> Girls do not aspire to scientific and technical careers because they perceive that women form a small minority in these fields, and this disparity leads them to assume that girls would be inappropriate and

unwelcome participants. Individual women who do participate in science may be viewed as eccentric and thought of as the 'token' exceptions that prove the rule[2].

A second study done by Marlies Sudermann in 1979[1] found that by Grade 12, 35 per cent of the girls compared to 67 per cent of the boys were taking enriched or advanced level mathematics. She reviewed what is known about girls' and boys' verbal, spatial and numerical test-score differences. Boys usually do better on the spatial and numerical test, while girls do better on verbal tests. There is a large overlap of ability between boys and girls in each area, so that noted sex differences are valid in terms of group averages only. These differences do not become evident until about age 10. When achievement was considered, it was found in a number of studies that girls were more successful in terms of overall averages than boys. Because students can take so many different courses, achievement in and of itself is not a good indicator for comparison purposes. However, taking into consideration all the variables, Sudermann found that IQ scores were less correlated with high school marks for girls than for boys.

Other research is available in Canada about women in non-traditional areas of study. A good review is provided by Roberta Mura of Laval University[3]. She considers three areas which affect the motivation of women. One is the myth that science is a male domain and girls fear success in this area. The other areas studied were the familiar ones of the school and the family. Mura distributed a questionnaire to participants at the 1981 meeting of the Canadian Mathematics Education Study group. Their responses prompted her to conclude that 'while there does exist some interest in gender and mathematics in Canada, at present this topic is not on the priority list of mathematics educators.'

Another line of research which may provide some direction for improvement of career planning for women has been undertaken in Ontario[4]. Again it was recognized that girls do not plan realistically for their working lives, and do not recognize the advantages and disadvantages of employment in non-traditional occupations versus traditional ones. Because early adolescent girls are most receptive in considering all types of employment as possibilities for their working years, Grade 9 girls were selected for the study.

Three different methods of increasing career-awareness were tested in a large secondary school in Toronto. The girls in the study were from all social classes. One group was given facts about the number of years women are likely to work along with information about careers. Another group was given the same facts and, in addition, some role models of working women. The third group used a game called 'Wheel of Fortune' where the girls adopted a character and followed her through her life, choosing various alternatives which existed for that character. For this last group of girls, more realistic outcomes were produced as to the number of years women could expect to work. This is a simple study and was mentioned only to illustrate the fact that new and innovative teaching methods are needed to educate young women about their futures and to promote achievement in non-traditional areas of study which are essential to professional jobs in high technology.

The findings from these studies are similar to the comments of consultants concerned with mathematics, education, guidance, careers and affirmative action in the Ottawa and Carleton Boards of Education, several of whom were interviewed. Various steps are being undertaken to attempt to improve the motivation of young women, to change attitudes within the area's educational institutions, and to change sex stereotypes. Some steps being taken are:

Affirmative action: Both the Carleton and Ottawa Boards of Education have affirmative action programs. Some of the guidelines of the Carleton Board of Education Affirmative Action program are[5]:

Role Modelling:	that school principals be encouraged to assign more women to teach senior grades, and to assign more men to teach junior grades;
	that the Board make an effort to hire and/or transfer qualified women capable of teaching in subject areas where women are under-represented, and that it make a concerted effort of teaching in subject areas where men are under-represented;
Elimination of Sex-role Stereotyping:	that, as soon as possible, sex stereotyping materials be eliminated;
	that positive use be promoted of those remaining materials that have special educational value, although they contain sex bias;
	that each student have the opportunity to develop abilities and aspirations without the limitations imposed by sex-role stereotyping;
	that all students, regardless of sex, have access to all courses or programs;
	that the Board encourage the integration of male and female students in Family studies, Industrial Arts and Physical Health Education classes.
Equal Employment Opportunities:	that there be open competition for vacant positions within the Carléton system.
Monitoring:	that the Board establish a forum for staff and students to review specific problems related to the area of Affirmative Action (e.g., sexual harrassment, inequities in salary).

This program was established in 1981. Results of the program are not yet available.

In one school, a lecturer tried to persuade young girls that they would be working for pay during their lives. The usual statistics and facts were used, but the girls would not believe what they heard. The activities of the Ottawa Board of Education will be directed more towards a 'soft sell'. For this, community television will be used. The focus will be on careers. Commencing in February, 1982, French and English programs will be available. The hope is that such programs will be seen by parents as well as by young people, for it is usually within the family that the 'double message' of paid work and family responsibilities which girls hear can be resolved. Reconciliation of this message and realistic planning of a girl's future should be a family concern.

The apparent lack of motivation observed in some young women and men was blamed on the fact that if there are no jobs following education, then young people will not continue to post-secondary education. Jobs exist obviously in the high technology industry, but according to representatives from Algonquin College, there is some reluctance among students to continue in courses which are considered 'tough'.

The Secondary Education Review Project Report[6]

This report, recently published by the Ministry of Education, Province of Ontario, contains discussions and recommendations which are relevant to this study. It notes that, although compulsory credits have now been introduced in secondary schools, many people who wrote to the Project believe that the system still allows students too much latitude. These opinions are supported in a recent survey of educational issues in which two thirds of the respondents said that students should have some choice, but they should be required to take courses in language and mathematical skills preparing them for university, community college or employment.

Further, the Report makes the following recommendation:

14. That the Ministry of Education continue to provide leadership in the effective use of the new electronic technologies by assisting boards, schools, and teachers:

    (a) to develop outlines of possible courses that could be introduced at early stages of schooling and continue to enable all students to become reasonably familiar with the impact of information technology on their present and future lives;

    (b) to include, at appropriate places in the secondary school program, information on the new technologies;

    (c) to pursue ways and means by which information technology with its attendant hardware and software, may be acquired and applied to methods of teaching and learning[6].

Finally, with regard to the activities of the high schools in preparing young women for entrance into the labour force, the frustration of many of the educators should be mentioned. If one thinks of a 'Bell-shaped curve' one can visualize women distributed along a continuum. There seemed to be less concern about the careers of young women at either end. The very bright women were probably going to university, with or without mathematics. Those at the other end were probably going to work in unskilled jobs. But the large bulk of young women were in the middle. They take the general level courses, and too many refuse to recognize that life is not going to be one where they stay home with their children. They are still conditioned to follow the traditional female role in society.

2. Adult Education

There are basic education courses in the community for those adults who wish to continue their education to Grade 12. As an example, day and night courses are offered in Ottawa through the Ottawa Board of Education, and at Algonquin College. It is estimated that a Grade 10 drop-out with average intelligence and average motivation could obtain a Grade 12 diploma in six to eight months. Costs are approximately $12.50 per week. Other adult education courses are available at all the other educational institutions in the area. Newspaper advertisements and special editions accompanying the newspapers advertise these courses quite extensively.

Both orientation and skill courses for computer-related occupations are offered. The demand for places, however, exceeds the supply.

After examining the many courses which are being given, one concludes that if women have the time and money, are able to arrange for the care of their children, and are able to obtain places in these courses, there are opportunities for them to receive the necessary training to secure computer-related occupations. However, our survey indicates that many women in the National Capital Region are not aware of these opportunities. Time and financial problems also present obstacles to many women wishing to take advantage of these opportunities.

3. Universities and Colleges in the National Capital Region

This area is well-provided with educational institutions. There are three universities in Ottawa, one in Hull and one community college in each city. All, except St. Paul's University, a theological seminary, provide computer-related courses.

At the university level, the programs most related to this study are computer science and engineering. We obtained the enrollment and application statistics, broken down according to sex. These September 1981 figures were used to determine the numbers accepted in specific programs. The figures clearly indicate that women are still a minority group in this non-traditional area of study. In all cases, there were many more applications for courses than were accepted.

Given that students apply to several universities, it is obvious that institutions cannot accept a majority of the applicants. For example, at Carleton University, of the 1 490 persons who applied to the Engineering Faculty in 1981, 280 were enrolled, 13 being women. The computer science program, however, had a larger percentage of women. In the first year of this program, 15 of 54 students were women.

At the University of Ottawa in the same year, just over 14 per cent of those who applied to study in the engineering and science faculties were accepted. In electrical engineering, there are 12 women and 311 men; in computer science, there are 85 women and 180 men.

At Algonquin College, because of the popularity of some of the courses, selection is done on a lottery basis. In other courses, admission is on a first-come, first-served basis. Many of the persons now working in computer-related occupations in this area have been trained at Algonquin. There could be many more trained if facilities were extended. Despite a recent 8.0 per cent increase in the basic provincial grant given to Algonquin for 1982-83, money is still desperately needed to purchase new equipment, replace older equipment and hire more staff, if demand of the local industry is to be met. Insufficient numbers of computer terminals and other equipment mean that students must work during the night to meet the requirements of their courses. Because there are waiting lists for most of the computer-related programs, most applicants face a waiting period from six months to a year or longer in duration. Below are some 1981 Algonquin College figures which indicate the numbers of students who apply to specific courses and the sex breakdown of those who are accepted.

Enrollment Figures - Algonquin College, September 1981

	No. of Applicants	No. Accepted	No. of Females Enrolled	No. of Males Enrolled
Computer Science	290	120	20	85
Computer System Technician	47	26	3	22
Electrical Engineering Technologist	324	154	5	142
Electronic Assembly	253	35	21	13
Electronic Engineering Technician	162	83	6	77
Digital Electronic Technician	30	29	0	28

Admissions Office, Algonquin College, Ottawa.

4. Private Business Schools

There are a number of private business schools in the National Capital Region offering courses in word processing, management, secretarial skills, sales, and computer programming. Training costs are dependent on the business, and the type of training being offered. The cost for a course in word processing ranges between $300-$1 000. Courses vary in length from 3 weeks to 2 months or longer. An official from one school estimated that well over 10 per cent of their students who were enrolled were re-entering the work force. Most of the word processing courses require some secretarial work experience (1-2 years), and a typing speed of a least 40-50 words per minute. This type of training can, if the individual can afford it, provide women relatively quickly with a skill that is in great demand. Some of these private schools do offer some financial support through the Ontario Student Assistance Program to students who cannot afford the costs of the program. As well, they will assist the student in finding employment after the course has finished.

These schools offer an efficient and fast means of retraining or upgrading women for employment in computer-related areas. However, the costs of such training limit these opportunities to women who have other means of financial support (i.e., a full-time job, a husband/co-habitant who has an income, etc.). We interviewed representatives from some of these schools in the region. We were told that word processing was what

could be done by those students who had completed a training course. Students found that these new machines were challenging, and they provided opportunities for learning and career advancement.

5. Canada Employment and Immigration Commission

We heard repeatedly from those women whom we interviewed that they did not know how to obtain information about training which would help them better their qualifications for employment in computer-related occupations. Below are brief descriptions of the relevant training opportunities which are available to women through the Ottawa office of the Employment and Immigration Commission.

(i) Mini-Career II

Mini-Career II is a three to four hour program offered once a week to ten women so they can discuss job opportunities available, what training is required for these jobs, how to look for a job and how to assess one's capabilities.

(ii) New Skills for Women

This is a program offered every second week to discuss the skilled jobs available for women. A brochure is available, put out by the Women's Bureau of the Ontario Ministry of Labour, which covers apprenticeship training, training provided in Community College programs, and Employment and Immigration Canada programs.

(iii) Introduction to Non-traditional Occupations

This is an eight-week course taught at Algonquin College, offered three times a year. This course is geared towards introducing women to occupations which traditionally have been male dominated. It teaches technical terms and procedures for job finding, life skills and assertiveness training. It provides mathematics placement-testing and may encourage women to pursue longer, more intensive programs. Up to four weeks of work exposure is part of this training, but some employers in the high technology industry are reluctant to provide women with this essential preliminary work experience. All women are eligible for sponsorship in this program and they receive a small allowance to defray costs.

(iv) Creative Job Search

In this program, 15 people meet every Wednesday morning to discuss employers' expectations, labour market information, job search techniques, resumé writing, and other related topics. The success rate in finding employment for participants in these seminars is about 60 per cent.

(v) Canada Manpower Training Program

The Canada Employment and Immigration Commission purchases 17 per cent of the places in non-traditional courses at Algonquin College. Women are given first choice and subsidization is provided as follows:

$70 per week for a self-supporting individual,
$90 per week for a self-supporting individual with one child,
$15 per week for each additional child,
$25 per week for a woman with a spouse who is a wage earner or who lives with parents,
a day-care allowance of $20 per week for each child.

All individuals who enter this program are tested at Algonquin College to determine their level of competence. Under this program it is possible for a person to enroll in a one-year upgrading course in 'Basic Skill Development', which provides students with pre-requisites for further training or employment. This program has continuous intake, but there are waiting periods of approximately 1-2 months for most of these courses.

Following the Basic Skill Development Training, it is possible to obtain a second year of skill training or, if basic skill development is not required, participants may enroll in a regular course in a non-traditional area. What follows are the courses which begin in September of each year at Algonquin College in the computer-related area and which are subsidized through the Canada Employment and Immigration Commission. Included are the numbers enrolled in each course, as well as how many are on the waiting list. These figures are broken down according to sex:

Computer Programming: There is a one-year waiting list for this program. The course is an accelerated one of 52 weeks and extremely popular. At the moment, there are 33 women and 61 men enrolled Twenty women and 24 men are on the waiting list and a person could wait up to two years to obtain training.

Electronic Technicians: An accelerated course of 52 weeks, with no openings until the fall of 1983.

Present Enrollment:	Women:	3	Men:	38
Waiting List:	Women:	7	Men:	29

Electronic Digital: A 48-week course.

Present Enrollment:	Women:	10	Men:	43
Waiting List:	Women:	3	Men:	13

Electronic Assembler: A 16-week course.

Present Enrollment:	Women:	172	Men:	149
Waiting List:	Women:	49	Men:	27

Electro-mechanical Drafting: An accelerated course of 52 weeks.

Present Enrollment:	Women:	9	Men:	23
Waiting List:	Women:	1	Men:	10

Word Processing: A 16-week course. Applicants must have Grade 10, be able to type 45 words per minute, and have a letter of acceptance from Algonquin College where applicants are tested. (The test used has been validated against success in the course.) Not all the places available through the CEIC in this course are used, and the number purchased has dropped from 60 to 42. It is offered 3 times a year, but there are openings continually because of persons graduating from the course.

Present Enrollment:	Women:	104	Men:	8
Waiting List:	Women:	7	Men:	0

(vi) On-the-job Training Programs

The following programs have been designed by the Canada Employment and Immigration Commission to provide on-the-job training, and are designed to assist employers with their training programs and also to assist individuals in obtaining employment. Women are given priority in these programs, except in word-processing training. These programs train new entrants to the labour force as well as those individuals who require retraining in a new field due to the effects of technological change. Under these programs, employers are subsidized by the Canada Employment and Immigration Commission to cover a percentage of the salary paid to employees who are being trained.

(a) The New Technology Employment Program: This is a new program which began in the fall of 1980. It is designed to create jobs for highly educated graduates in scientific and technical fields who are unable to find employment in their discipline. Various conditions are prescribed to employers to ensure that trainees are not exploited, and that adequate training is undertaken. Potential trainees must be graduates from a post-secondary institution and must have been in the labour force for two years. So far, this program has created 723 new jobs, 30 per cent of which have been filled by women.

(b) Critical Skills Training Program: This program provides direct financial assistance to industry to cover the training costs and wage support of each trainee up to $170 per week. These funds help to meet the expenses incurred during a maximum of two years of the four to five year training period required in pre-determined, labour-short trade occupations. In the Ottawa area, there are two women in this program who work in the high technology industry. One is being trained as a machinist and the other as a technical service representative. The Ottawa-Carleton Industrial Training Council decides which industries in the region are eligible for training support under this program. As yet, high technology industries are not eligible for this program, but a survey of their eligibility is being undertaken.

(c) Canada Manpower Industrial Training Program: Under this program, individuals can locate an employer who is willing to train them in a non-traditional area, and Canada Employment and Immigration will pay the employer up to 75 per cent of their salary for a specified training period.

6. Training Offered by the Government of Ontario

Tippy II

The Government of Ontario has a program entitled Tippy II. This is a new program which provides funds to high technology industries to train and upgrade their present staff. Since it is such a new program, statistics are not yet available as to how many women have been involved. It was introduced in the Ottawa region on April 3, 1981, and has been very successful. $600 000.00 was given to the Ottawa Regional Office of the Ministry of Education and it is expected that funds will have to be increased before the end of the year.

Summary of Government-Funded Training Programs sponsored by the CEIC

Two recent reports, Labour Market Developments in the 1980's[7] and Work for Tomorrow, Employment Opportunities for the 80's[8], summarize many of the shortcomings of government-funded training programs which we also encountered in the course of our study. These reports come to conclusions about the training and counselling services available through the CEIC. For example, over the years, many different training programs have evolved from this department. Names and structures of these programs have changed so that it is sometimes very difficult for CEIC staff, as well as their clients, to keep up to date on all the training and counselling opportunities. Women are often recommended by counsellors to take training programs in an occupation where women have always dominated. Counsellors are not prepared to screen job applicants properly in order to meet requirements of specific types of employment[8]. We feel that these shortcomings help to account for some of the problems which we encountered in our research, and for the problems the women we interviewed cited, such as the Canada Employment and Immigration Commission's lack of information about training courses, improper counselling, and traditional employment opportunities being encouraged for women.

References - Chapter IV

1. Sudermann, Marlies, Sex Differences in High School Course Choice and Achievement: Cause for Concern?, Research Report 79-09, Ottawa Board of Education, Ottawa, November 1979.

2. Russell, Susan Jessie, Sex Role Socialization in the High School. A Study of Perpetuation of Patriarchal Culture, a thesis for the Degree of Doctor of Philosophy, Department of Sociology, University of Toronto, 1978.

3. Mura, Roberta, "Gender and Mathematics in Canada", Faculty of Education, Laval University, Québec City, 1981.

4. Sayer L. and Dormar Ellis, 'The Wheel of Fortune of the Love Boat', ORBIT, October 1981, 59, Vol. 12, No. 4.

5. Carleton Board of Education, Affirmative Action Guidelines, (WP:3B-18), Ottawa, October 16, 1981.

6. Ontario Ministry of Education, Secondary Education Review Project Report, Government of Ontario: Queens Park, Toronto.

7. Employment and Immigration Commission, Labour Market Developments in the 1980's, Ottawa, July 1981.

8. House of Commons, Canada, Work for Tomorrow: Employment Opportunities for the '80's, Ottawa, Cat. No. XC2-321/4-01E.

RECOMMENDATIONS

These recommendations are divided according to the main responsibility centres for their consideration.

The High Technology Industry (private sector)

1. Be urged to adopt an active program which encourages and enables women to retrain and to upgrade their skills; which recognizes the varied career patterns which women adopt to harmonize family and economic responsibilities; which fully taps into the human resources women have to offer the Canadian economy.

2. Combine their resources in a concerted effort to inform women in the region about the opportunities which exist in the industry so that full use is made of women as human resources. This should be done at all levels in co-operation with community groups and services -- e.g., schools, colleges, universities, women's groups, career counselling centres, etc.

3. Co-operate with educational institutions to devise innovative and economically feasible means of providing women with the skills they need to match present and future shortages.

4. Increase its efforts to inform high school girls and young women of the opportunities which exist in the micro-electronic industry at all levels, now and in the future.

Governments

1. All levels of governments increase the quality and quantity of on-the-job training programs available to employees in lower categories of employment.

2. All levels of government intensify their efforts to increase the awareness among women of the opportunities that exist in the micro-electronic industry and to increase awareness about the educational and training requirements for such careers.

Training

1. More training should be provided by educational institutions, governments and the private sector to meet the needs of both potential employees and the high technology industry. Women should be actively encouraged to take part in these training programs.

2. Additional counselling centres for women should be provided by educational institutions and concerned government departments in the National Capital Region which are closely related to the high technology industry. Women must be provided with up-to-date and accurate information on new employment and training opportunities, job requirements, rate of pay, etc.

3. Research and development should be undertaken by colleges, universities and governments to develop more innovative and effective training and apprenticeship programs for women in non-traditional areas. These programs should work to dispel the fear of technology and increase self-confidence among women by providing them with marketable skills. In order that it is feasible for women to take these programs, adequate financial support as well as flexible training hours are needed.

Education

1. Educators and parents should work collectively and individually to eliminate societal, attitudinal and institutional barriers which are preventing women from studying mathematics, science and technology at all levels in our educational institutions.

2. Educators should take all possible action to increase the participation of high school girls in mathematics, science and technology. Particular concern should be devoted to those at the Grade 9 level, where subject choice begins to affect career patterns.

3. Girls, from Grade 7 through high school, should be counselled about the importance of science, mathematics and technology to their future careers and quality of life.

4. A careful study should be made of the potentially positive effects of teaching girls science and mathematics in segregated classes.

5. Funding allocations to colleges and universities in the region should be secured innovatively and economically to increase the number of spaces available in educational institutions in the National Capital Region so that the demands of the high technology industry are met.

6. Computer-related training courses should be introduced into all schools, and girls be encouraged to pursue such courses.

Awareness

1. National

Industry and governments at all levels should co-operate to raise public awareness of the needs of the micro-electronic industry through mass media advertising campaigns, and circulation of literature, audio-visual programs and speakers in schools and training institutions. Emphasis should be placed on the measures needed to ensure that women are as well-prepared for jobs at all levels of the industry as men are.

2. Local

(a) A popular training manual should be produced by a concerned government department. This manual should be widely circulated in order to make women more aware of the precise details of all local training programs.

(b) The Science Council of Canada's brochure, 'Women in Science: Aim of the Eighties', should be circulated by the Science Council to all local educational and training institutions.

(c) Through a local bilingual educational institution (such as Algonquin College), the efforts of educators, governments and industry should be combined to increase awareness in the National Capital Region of the micro-technology industry and its human resource requirements. The Women's Bureau of the Department of Labour Canada should take an active part in this awareness program by providing literature and organizing a workshop which is particularly geared to informing women about possible employment in this industry, and preparing them for it. The Women's Bureau should also monitor all of the activities of the program to ensure that traditional stereotypes of women are not perpetuated.

The components of this local awareness campaign should include:

i) Press and the electronic media paid advertising;
ii) Public Service Announcements;
iii) Interviews with press and television media;
iv) Related film clips and fillers to be provided to local television stations;
v) Films and audio-visual programs about women and micro-technology for use in schools, community groups, etc.;
vi) Establish a speaker's bureau;
vii) Sponsor speakers on the subject;
viii) Organize workshops to inform the public about the high technology industry and its human resource requirements.

CONCLUSIONS

The main purpose of this study was to integrate women into the emerging micro-electronic industry in the National Capital Region. The facts, as we found them, have been presented. The statistics, although somewhat sparse and rapidly changing, have been included wherever possible; the needs of the new industry have been surveyed and summarized, and the attitudes of women and the barriers they find to employment in this industry have been discussed.

The answer to one major question seems to be crucial in determining the kind of action that this report recommends: Are women suffering loss of employment because of the informatics revolution?

Our study of the current literature brought together many dire predictions about women's employment predicament as high tech becomes prevalent. However, it should be noted that we did not encounter any unemployed secretaries or clerical workers in our study.

In other words, we found no field evidence that the loss of such jobs which the new communications equipment brings about is causing lengthy unemployment periods for women with traditional office skills.

It should be noted, however, that our study was limited to the National Capital Region, where the booming high tech industry and the employment opportunities it has created may not be typical of the situation for women across the country.

It was not within our mandate to pursue this question. For this, reference should be made to the in-depth work on this subject being done by Heather Menzies. While agreeing with her well-documented conclusion that traditional women's jobs are being discontinued, we cannot subscribe to the alarmist predictions of some authors that there is no replacement work for women.

What our findings call for, and what all our recommendations aim to bring about, is a new attitude to the exciting job possibilities which exist for women in the computer age, a new attitude on the part of employers, governments, educators and women themselves.

This new attitude will result in enlightened awareness campaigns and educational and employment policies on the one hand, and the active pursuit of educational training and the rewarding jobs of the new industry on the other.

Above all, what seems to be called for is the active fusion of the efforts of all concerned. The suggestion of such a co-operative effort has not been included in our recommendations, but the mechanics must be left to the appropriate authorities.

Two overriding concerns should be kept clearly in view: the micro-electronic industry needs a trained work force immediately and, for traditional reasons, most women are not, at present, ready to fill the available positions. For the sake of women and the Canadian economy, drastic measures need to be taken to change that situation.

GLOSSARY OF DEFINITIONS

In any description of high technology, terms are used with which the reader may not be familiar. Some definitions seem necessary. These are listed alphabetically below.

ALGORITHM — A defined process or set of rules that preplans and assures development of a desired output from a given input. A sequence of formulas and/or algebraic/logical steps to calculate or determine a given task; processing rules.

ANALYST — An individual who is skilled and trained to define problems and to analyze, develop and express algorithms for their solutions, especially algorithms that may be resolved and implemented by a computer.

BUG — 1. Any mechanical, electrical or electronic defect that interferes with the operation of the computer. It can also be a defect in the coding of the program.
2. A mistake in the design of a routine or a computer, or a malfunction.
Therefore, to debug is to correct a malfunction (or the process by which a malfunction is corrected).

CHIP — An integrated circuit or integration of many circuits on a wafer slice, most often made of silicon.

COMPUTER — A device capable of accepting information, applying prescribed processes to the information and supplying the results of these processes. It usually consists of input and output devices, storage, arithmetic and logical units, and a control unit.

DATA — A general term used to denote any or all facts, numbers, letters and symbols that refer to or describe an object, idea, condition, situation, or other factors. It describes basic elements of information which can be processed or produced by a computer.

DATA BASE — A computerized bank of data.

DATA PROCESSING — 1. Any procedure for receiving information and producing a specific result.
2. Rearrangement and refinement of raw data into a form suitable for further use.

ELECTRONIC ASSEMBLER	One who works on an assembly line in a high technology company fabricating and assembling the micro-electronic components which are used in micro-electronic and computer products.
ELECTRONIC ENGINEER	Studies design proposals, develops and supervises the manufacture, installation, testing, inspection, repair and maintenance of electronic equipment, systems and components used in the communication, data processing, etc., fields. Performs duties which include the preparation of preliminary cost estimates for manufacture of electronic equipment and the development of test apparatus.
ELECTRONIC ENGINEERING TECHNOLOGIST	Performs technological functions in various aspects of electronic engineering, primarily in support of research, design and development.
ELECTRONIC ENGINEERING TECHNICIAN	Performs technological functions in various aspects of electronic engineering, primarily in support of installation, operation maintenance, production and quality control.
HARDWARE	The electric, electronic and mechanical equipment used in processing data, consisting of cabinets, racks, tubes, transisters, wires, motors and such. Any piece of automatic data processing equipment.
HIGH TECHNOLOGY	In the Ottawa-Carleton region, high technology industries generally refer to those industries primarily engaged in electronics. However, this terminology is sometimes more broadly used in other circumstances.
INPUT	Information or data transferred from an external storage medium into the internal storage of the computer.
LOGIC	1. Specific to the high technology field, logic is the science that deals with the laws and criteria of validity in thought and demonstration; the science of the formal principles of reasoning. (The ability to exercise a scientific method of thought process is fundamental to working in high technology industries. Analysts and programmers are tested for their ability to think 'logically'.)
OUTPUT	Computer results, such as answers to mathematical problems, statistical, analytical or accounting figures, production schedules, etc.

PROGRAM	A plan for the automatic solution of a problem. A complete program includes plans for the transcription of data, coding for the computer and plans for the absorption of the result into the system. A list of coded instructions is called a ROUTINE.
PROGRAMMER	1. One who prepares programs for a computer. 2. A person who prepares instruction sequences without necessarily converting them into detailed codes. 3. A person who prepares problem solving procedures and flow-charts and who may also write and debug routines.
SOFTWARE	Programs or routines which usually have common or multiple applications for many systems, i.e., report generators, sort routines, conversion programs which can be used for several routines in language common to many computers.
SYSTEMS ANALYST	A person who designs information-handling procedures which incorporate computer processing. The systems analyst is usually highly skilled in defining problems and in developing algorithms for their solution.
TERMINAL	An input/output device designed to receive data in an environment associated with the job to be performed and capable of transmitting entries to, and obtaining output from, the system of which it is a part.
WORD PROCESSING	Operations including a process by which the user recovers desired information or data from the system; text editing, translation and typesetting may also be performed.
WORD PROCESSOR	One of the many types of office automation machines. A typical unit has super and subscripts, repaginations, document assembly capability and standard editing functions.
WORD PROCESSOR	User of a word processor who works in a 'dialogue' with the system. The operator uses a keyboard to type the required document into the word processor. This action is preceded and followed by specific machine instructions that tell the equipment where to put the document, what to call it, whether to store it, what type of layout to be used, etc.

BIBLIOGRAPHY

Arnopoulos, Sheila McLeod, Problems of Immigrant women in the Canadian Labour Force, Canadian Advisory Council on the Status of Women, Ottawa, January 1979.

Association of Professional, Executive, Clerical and Computer Staff, Office Technology - The Trade Union Response, London: College Hill Press, 1979.

Broadcasting and Social Policy Branch, Social Implications of Computer Based Communications Systems, Department of Communications, Ottawa, August 1979.

Buchanan, Lillian, Organized Labour and Technical Change, Women's Bureau, Labour Canada, March 1980.

Bucovetsky, Meyer W., Studies in Public Employment and Compensation in Canada, Institute for Research on Public Policy, Montréal, 1979.

Baldwin, Susan L. and Michael G. Ryan, The Office of the Future: A Plethora of Potential, Department of Communications, Ottawa.

Bonavia, George, Focus on Canadian Immigration, Department of Manpower and Immigration, Ottawa, January 1977.

Braden, John H.C., Office Occupations Statistics Research Paper, Department of Communications, Ottawa, October 1980.

Canadian Advisory Council on the Status of Women, Critical Skill Shortages: New Opportunities for Women, Ottawa, January 1981.

Canadian Advisory Council on the Status of Women, Part Time Work: A Review of The Issues, Advisory Council of Employment and Immigration Canada, Ottawa, January 1981.

Canadian Advisory Council on the Status of Women, Recommendations of the CACSW By Subject, Ottawa, January 1981.

Canadian Advisory Council on the Status of Women, Women in the Public Service: Barriers to Equal Opportunity, Ottawa, January 1979.

Canadian Advisory Council on the Status of Women, Women in the Public Service: Overlooked and Undervalued, Ottawa, October 1980.

Canadian Centre for Occupational Health and Safety, Visual Display Terminals: A Selected Bibliography, Interim edition (0492B), Hamilton, September 14, 1981.

Canadian Centre for Policy Alternatives, The Implications of Microelectronics For Canadian Workers, Ottawa, 1981.

Canadian Labour Congress, Equal Partners for Change: Women and Unions, Labour Education and Study Centre, Ottawa, 1979-80.

Canadian Committee on Learning Opportunities for Women, Cutbacks to Training Allowances and Outreach Programs: Their Impact on Women, Toronto, May 1971.

Canadian Federation of Communications Workers, Employment Trends and Technological Change in the Canadian Telecommunications Industry, Toronto, November 1977.

Canadian Union of Public Employees, Union Brief to Canadian Standards Associations on Office Automation, Research Department, Ottawa, March 1981.

Carleton Board of Education, Affirmative Action Guidelines, (WB:3B-18), Ottawa, October 16, 1981.

Ciuriak, Dan and Harvey Sims, Participation Rate and Labour Force Growth in Canada, Department of Finance, Ottawa, April 1980.

Coates, Sharon, The Office of the Future, Department of Communications, Ottawa.

Cohen, Leah, A Review of Women's Participation in the Non-traditional Occupations, Labour Market Development Task Force, Technical Study No. 8, Ottawa, July 1981.

Commercial and Industrial Development Corporation, CIDC Business Director, Ottawa, 1981.

Confederation College of Applied Arts and Technology, INTO: Introduction to Non-Traditional Occupations, Thunder Bay, Ontario, February 1980.

Dale, Patricia, Women and Jobs: The Impact of Federal Government Employment Strategies on Women, Canadian Advisory Council on the Status of Women, Ottawa, June 1980.

Department of National Defense, A Review of the Office Composing Equipment Classification (Draft), Ottawa, July 1981.

Devereaux, M.S., and Edith Rechnitzer, Higher Education - Hired?, Labour Canada, Women's Bureau, Ministry of Supply and Services, Ottawa, August 1980.

Employment and Immigration Canada, Abstracts of Technical Studies, Task Force on Labour Market Development as background papers for its report, "Labour Market Developments in the 1980's", Employment and Immigration Canada, Ottawa, July 1981.

Employment and Immigration Canada, Annual Report to Parliament on Immigration Levels 1982, Ottawa, Cat. No. WH-5-019, November 2, 1981.

Employment and Immigration Canada, Annual Statistical Bulletin 1979-80, Canada Manpower Training Program, Ottawa, Cat. No. WH-7-088E, December 1980.

Employment and Immigration Canada, Canada Community Development Projects, Ottawa.

Employment and Immigration Canada, 'Electronic Data Processing Occupations', Careers Canada, Ottawa.

Employment and Immigration Canada, Creative Job Search Techniques are ..., Ottawa, 1981.

Employment and Immigration Canada, Employment Programs and Services for Canadians, Ottawa.

Employment and Immigration Canada, Interdepartmental Evaluation Study of the Canada Manpower Training Program, Ottawa, May 1977.

Employment and Immigration Canada, CMTP Planning Process-Ottawa District Economy Industry Review and Outlook, Ottawa District Economist Office, September 1981.

Employment and Immigration Canada, Labour Market Development in the 1980's, Ottawa, July 1981.

Employment and Immigration Canada, Unemployment Insurance in the '80's, Ottawa, July 1981.

Fennema, Elizabeth, 'The Sex Factor', Mathematics Education Research, September 1981.

Foster, Theodora C., 'The Challenge of the Eighties: Women, Change and Education', organized by The Education Committee of the University Women's Club, Ottawa, November 11, 1981.

Friedrichs, Gunter, The Coming Decade of Danger and Opportunity: Micro-electronics - A New Dimension of Technological Change and Automation, presented to the Club of Rome Conference, Berlin, October 3-6, 1979.

George, Anne, Occupational Health Hazards to Women, Canadian Advisory Council on the Status of Women, Ottawa, October 1976.

Ginzberg, Eli, Facilitating the Reentry of Women to the Labour Force, The Conservation of Human Resource Project, Columbia University: New York, November 1979.

Grostern, Victor and Valerie Potter, Survey of Skilled Manpower Needs, Five Counties Industrial Training Council, Ottawa, October 1979.

Harragan, Betty, Games Mother Never Taught You, Warner Books Inc.: New York, NY 10019, 1978.

House of Commons Canada, Work for Tomorrow: Employment Opportunities for the '80's, for the Parliamentary Task Force on Employment Opportunities For the '80's, Ottawa, Cat. No. XC2 -321/4-01E.

Humphreys, Elizabeth, Technological Change and The Office, Labour Market Development Task Force Technical Study 17, Ottawa, July 1981.

International Labour Office, Women, Technology and the Development Process, Geneva, 1978.

Jeccinis, C.A., "The Impact of Microelectronic Technology on Employment: A Survey of Current Research Studies and Related Politics", for the Labour Market Information and Analysis Unit, Ontario Manpower Commission, Thunder Bay, July 1980.

Kondo, Yoshio, Company-wide Quality Control in Japanese Industries and its Impact on Quality of Work Life, Kyoto University: Kyoto, 1981.

Labour Canada, Equal Opportunities for Women Program, Ottawa, 1981.

Labour Canada, Women's Bureau, The Impact of Micro-electronic and Communications Technology on the Industrial Work Environment, Ottawa, Vol.1-3, March 1981.

Labour Canada, Women's Bureau, Background Paper for the Conference: The Impact of Micro-Electronic and Communications Technology on the Industrial Work Environment, Ottawa, May 27, 1980.

Labour Canada, Women's Bureau, It's Time to Wake Up Sleeping Beauty!, Ottawa, 1979.

Labour Canada, Women's Bureau, Legislation Relating to Working Women, Ottawa, Cat. No. L38-32/1979.

Labour Canada, Quality of Working Life, Ottawa: Minister of Supply and Services Canada, Cat. No. L82-34/1980E.

Labour Canada, Quality of Working Life: Job Design and Sociotechnical Systems, Quality of Working Life Unit, Ottawa, November 1979.

Lawson, Marie Bergom, Women and Technology in the Industrialized Countries, Science and Technology Working Papers Series, No. 8, New York: United Nations Plaza, 1979.

Leontief, Wassily, New Technology and Employment Opportunities, A discussion paper prepared for Labour Canada's National Conference on "Micro-Electronics and the Work Environment," Ottawa, 1981.

Lowe, Graham S., Problems and Issues in the Unionization of Female Workers: Some Reflections on the Case of Canadian Bank Employees. Presented at the 'Women in the Canadian Labour Force' workshop sponsored by the Social Science and Humanities Research Council, University of British Columbia: Vancouver, October 1980.

Mamiya, Kaoru, Science and Technology Education in Japan, Embassy of Japan: Ottawa, November 10, 1981.

Mather, Boris, Computerization and Employment: A Labour View, Ottawa: Canadian Federation of Communications Workers, Ottawa, 1980.

Maynard, Jeff, Dictionary of Data Processing, Newnes-Butterworths: London, Toronto, 1975.

Meltz, Noah M., Frank Reid and Gerald S. Swartz, Sharing the Work: An Analysis of the Issues on worksharing and jobsharing, University of Toronto Press: Toronto, 1981.

Melvyn, Peter, Microelectronics and Industrial Relations, International Labour Office: Geneva.

Menzies, Heather, Information Case Studies (Supplementary Material to "Women and the Chip"), Labour Market Development Task Force Technical Study No. 23, Employment and Immigration Commission, Ottawa, Cat. No. MP15-4/23-1981E, Ministry of Supply and Services Canada, 1981.

Menzies, Heather, The Micro-electronics Revolution: Industry and Government Perspectives, A discussion paper for Seminar on Trade Unions and Technology, The Ontario Federation of Labour: Toronto, April 17, 1980.

Menzies, Heather, Women and the Chip, Institute on Public Policy, Ottawa, 1980.

Mears, Jan, 'Quality of Working Life and Women' from Quality of Working Life, Vol. 4, No. 2, Labour Canada: Ottawa, 1981.

Microelectronics '80, A survey of high technology companies in the Regional Municipality of Ottawa-Carleton, Ontario Ministry of Industry and Tourism: Ottawa, October 20, 1980.

Ministry of Education, Secondary Education Review Project Report, Government of Ontario: Queen's Park, Toronto.

Mura, Roberta, "Gender and Mathematics in Canada," Faculty of Education, Laval University, Québec City, 1981.

Nelson, Theodor, Computer Lib, 702 South Michigan, South Bend, IN 46618.

Nielsen-Addison, Bente C., Equality Education Employment, Women's Program Department, Algonquin College, Ottawa, 1980.

Norman, Colin, Worldwatch Paper 39, Microelectronics at Work: Productivity and Jobs in the World Economy, c. Worldwatch Institute, Massachusetts, October 1980.

Okamatsu, Sozaburo, Influence of Micro-electronics on the World Economy, Prepared for the Women's Bureau, Labour Canada, Ottawa, March 1981.

Ontario Status of Women Council, Employment Strategies for Women in the 1980's: Recommendations for Action, Toronto, April 1980.

Ontario Status of Women Council, Employment Strategies for Women in the 1980's: A Background Report, Toronto, April 1980.

Ottawa-Carleton Industrial Training Council, Advanced Technology Human Resources Requirement Survey, Ottawa, May 1981.

Pearson, Mary, The Second Time Around: A Study of Women Returning to the Work Force, Canadian Advisory Council on The Status of Women, Ottawa, April 1979.

Peitchinis, Stephen G., Technological Changes in Banking and their effects on Employment, Industry, Trade and Commerce, Technology Branch: Ottawa, January 1977.

Peitchinis, Stephen G., The Effect of Technological Changes on Educational and Skill Requirements of Industry, Department of Industry, Trade and Commerce, Technology Branch: Ottawa, April 1978.

Peitchinis, Stephen G., The Attitude of Trade Unions Towards Technological Changes, Department of Industry, Trade and Commerce, Technology Branch: Ottawa, April 1980.

Peitchinis, Stephen G., The Employment Implications of Computers and Telecommunications Technology, Department of Communications: Ottawa, April 1981.

Public Service Alliance of Canada, Policy Paper on Tech Change.

Public Service Commission, Information received from the Training Division, Ottawa, January 1982.

Public Service Commission of Canada, Careers, Public Service Canada - Employment Opportunities for University Graduates 1982, Minister of Supply and Services Canada, Cat. No. SC 2-7/1981-5, Ottawa, 1981.

Public Service Commission of Canada, Annual Report, Ottawa, 1981.

Purdham, Dr. James T., A Review of the Literature on Health Hazards of Video Display Terminals, Canadian Centre for Occupational Health and Safety: Hamilton, October 1980.

Planning Department, Regional Municipality of Ottawa-Carleton, High Technology Industries in Ottawa-Carleton, Ottawa, 1980.

Rada, J., The Impact of Micro-electronics, c. International Labour Office: Geneva, 1980.

Ray, Dr. Ratna, The re-entry of Canadian Women into the Labour Force, Women's Bureau, Labour Canada: Ottawa, November 1979.

Reid, Julyan, The Impact of Microchip Technology on Women and Work: An Overview.

Regional Municipality of Ottawa-Carleton, Planning Department, Internal Report on High Technology industries in the Ottawa-Carleton region.

Russel, Susan Jessie, Sex Role Socialization in the High School. A Study of Perpetuation of Patriarchal Culture, a thesis for the Degree of Doctor of Philosophy, Department of Sociology, University of Toronto, 1978.

Sayer, L. and Dormar Ellis, 'The Wheel of Fortune of the Love Boat', Orbit, October 1981, 59, Volume 12, No. 4.

Science Council of Canada, The Impact of Microelectronics Revolution on Work and Working, Proceedings of a Workshop sponsored by the Science Council of Canada Committee on Computers and Communication, Ottawa, July 1980.

Science Council of Canada, A Scenario for the Implementation of Interactive Computer-Communications Systems in the Home, Ottawa, July 1979.

Science Council of Canada, A Statement of Concern The Science Education of Women in Canada, Ottawa, January 1982.

Science Council of Canada, Who Turns the Wheel?, Proceedings of a Workshop on the Science Education of Women in Canada, Ottawa, January 1982.

Scott, Joan Pinner, Canadian High School Girls Science Subject Choice and Achievement Behaviour in the Context of Co-Educational Schools and the Labour Market, Toronto, 1980.

Sear, Baroness Nancy, Chairman, House of Lords Select Committee on Unemployment, Great Britain, speaking at a conference in Ottawa, March 29, 1981. Reported in The Impact of Micro-Electronics and Communications Technology in the Industrial Work Environment, Labour Canada, Volume I.

Sippl, Charles J. and Roger J. Sippl, Computer Dictionary, Howard W. Sams and Company, Inc.: Indiana, 1980.

Statistics Canada, Marriage, Divorce and Mortality, A life table analysis for Canada, Cat. No. 84-536, Ottawa, May 1981.

Stinson, Jane, Technological Change and Working Women, Prepared for the Organized Working Women (OWW) Conference on Women and Employment, Canadian Union of Public Employees, Research Department, Ottawa, February 1980.

Sudermann, Marlies, Sex Differences in High School Course Choice and Achievement: Cause for Concern? Research Report 79-09, Ottawa Board of Education, Ottawa, November 1979.

Swan, Carole, Women in the Canadian Labour Market, Labour Market Development Task Force Technical Studies Series, Technical Study No. 36, Ottawa, July 1981.

Tapscott, Don, Perspective for the Office of the Future, B-N Software Research Inc., 1979.

Tengelin, Urika, Effects of Computerization on Employment and Working Environment, Prepared for the Conference on Micro-electronics and the Work Environment, Women's Bureau, Labour Canada, Ministry of Budget, Sweden, 1981.

Townson, Monica, The Structure of the Workplace in the 1980's: The Implications for Women, Speech to the Canadian Association of Administrators of Labour Legislation, Montréal, 1980.

Treasury Board, Secretaries in the Public Service: A Study on Their Employment, Utilization and Career Progression, March 1976.

Warskett, G., Technological Unemployment: The Case of Computers, Department of Communications: Ottawa, June 1980.

Westley, William, "Problems and Solutions in the Quality of Working Life", Human Relations, Nov. 2, 1979, pp. 113-123.

White Julie, Women and Unions, Canadian Advisory Council on the Status of Women, Ottawa, April 1980.

Whitefield, R.C., "Educational Research and Science Teaching", School Science Review, March 1979, 60, 411-430.

Willis, Janet, Learning Opportunities for Women in Canada: Perceptions of Educators, Canadian Committee on Learning Opportunities for Women.